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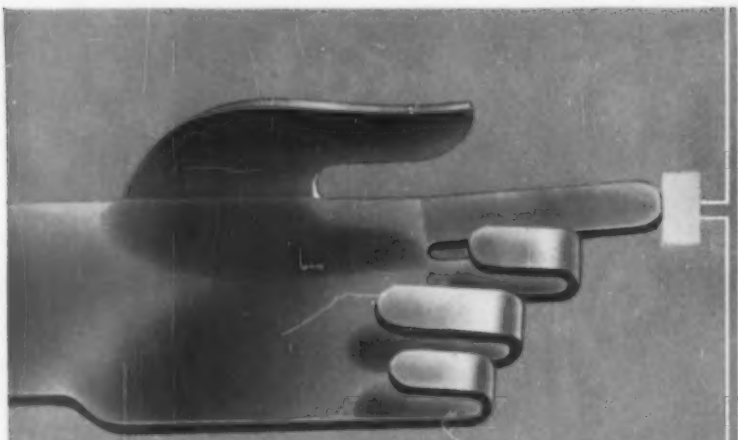

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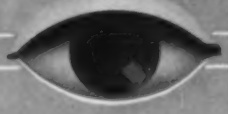

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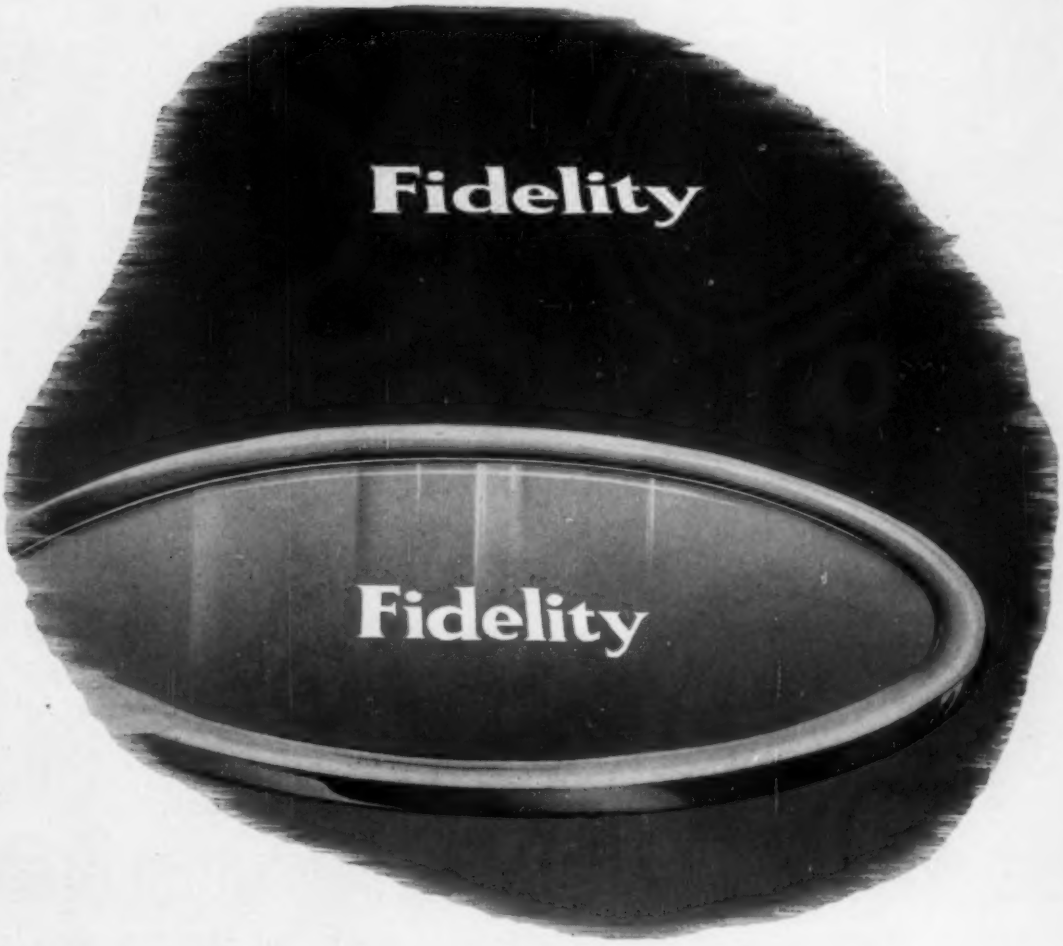

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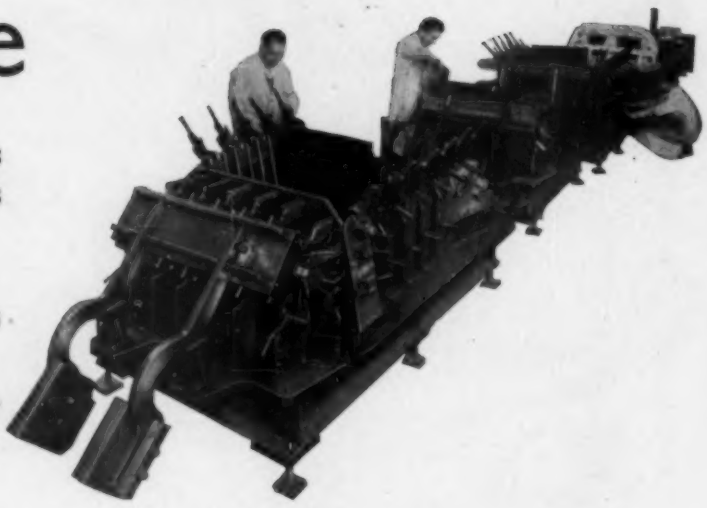

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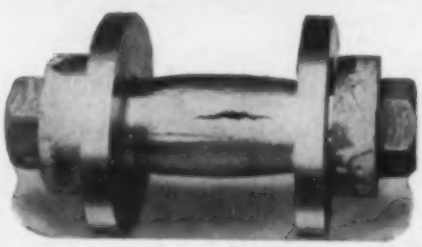

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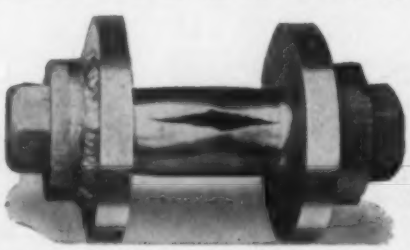

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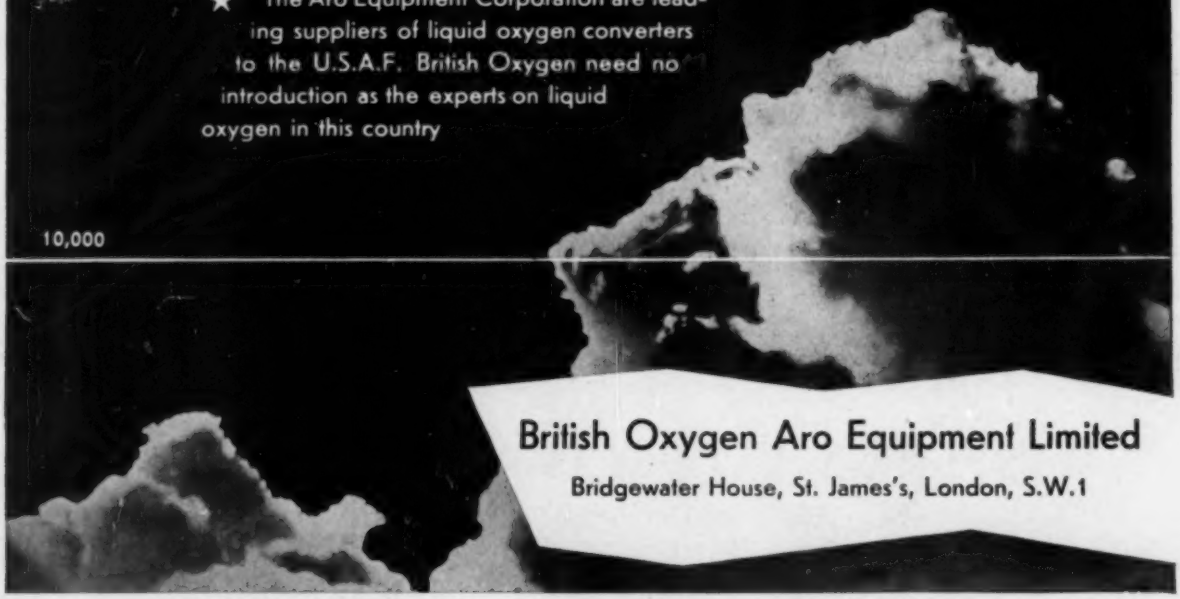

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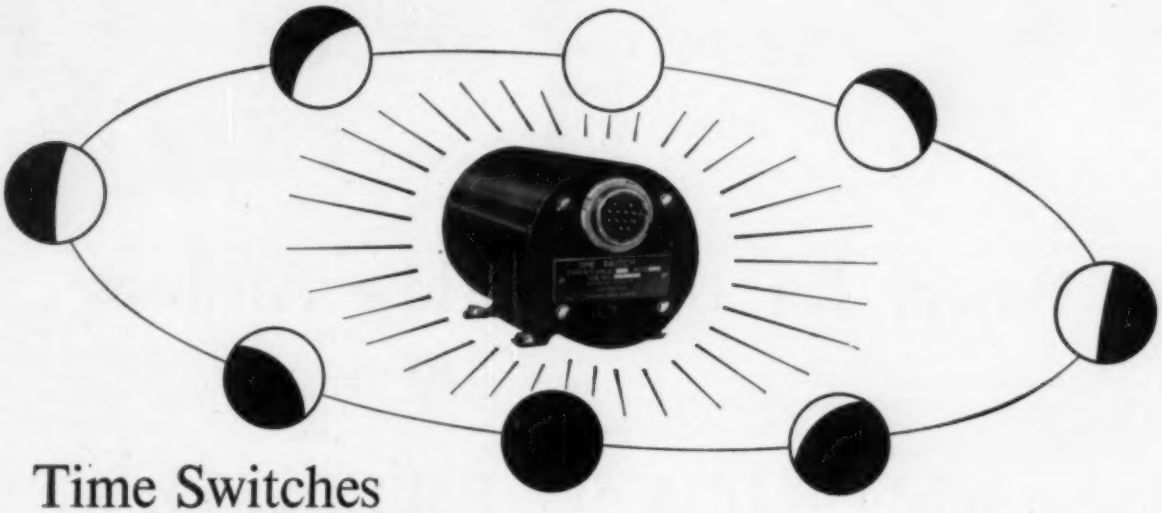

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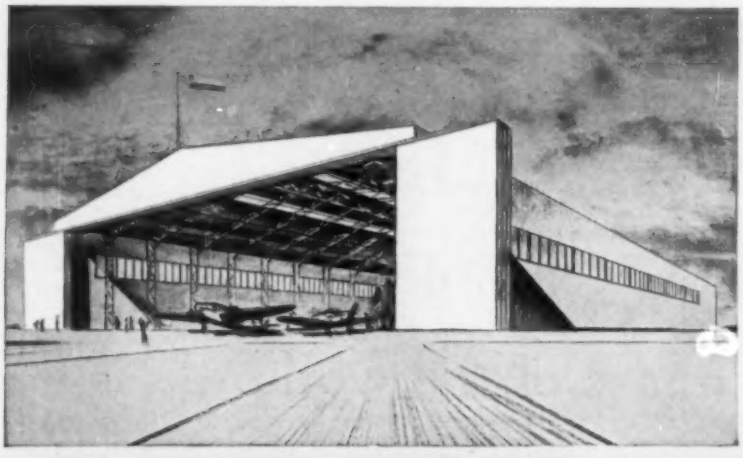

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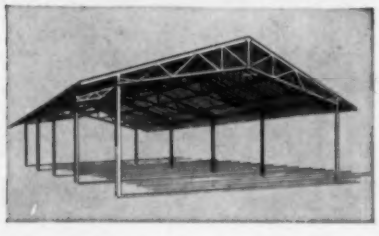

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FLIGHT
and
AIRCRAFT ENGINEER

No 2475 Vol 69 FRIDAY 29 JUNE 1956

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Claws and Starter-Claws

WE found ourselves smiling a little smugly last week at a photograph depicting pilots of the Soviet 200th Air Division taking their leave of East German burgesses, for the sweet chariots waiting for to carry them home were, incredibly, Il-10s—with Hucks starter-claws into the bargain! And should any reader be little edified by this piece of intelligence (for which he may be forgiven) the Il-10 is essentially the 1940 Stormovik.

But with Monday morning came first reports of the Moscow Aviation Day fly-past, which left us but little inclined to mirth, for the show of technical quality had evidently set Western observers smartly back on their heels.

In point of numbers, some viewers expressed disappointment, particularly in respect of bombers, though Mr. Krushchev himself explained this deficiency with a candid "These naturally we have . . . but it shows our desire for peace." Four turboprop Bears, three Bisons and nine Badgers were, of course, the merest token. It was the new fighters that fluttered the peaceful Western dovecotes—three deltas (with tails), two modified Farmer supersonic day fighters, and two modified Flashlight all-weather twin-jet fighters (one with a transparent nose suggestive of a bomber application). Fifty standard Flashlights and 60 Farmers had previously passed by. There was, also, a new Antonov transport, in the "Valetta replacement" class, our own neglect of which we earlier deplored.

All in all, a generous contribution to goodwill and technical intelligence. Now Mr. Krushchev tells us "Show us your planes" (he evidently means our prototypes) "and we will show you our rocket missiles." What can we lose?

Our Gentle Giant

WHEN the Cyprus trouble flared up last January we described the lifting of troops in Shackleton maritime-reconnaissance aircraft as a travesty of Commonwealth defence—a sentiment which was echoed in the House. Lamentably, though hardly remarkably, this country's strategic trooping resources remain today much as they were on that same depressing occasion ("Hastings few and approaching obsolescence . . . replacement by the Britannia still far off . . . no successor to the Valetta chosen"); but in two other respects the fortunes of R.A.F. Transport Command have taken a decided turn for the better. We have in mind the placing in service of the Blackburn and General Aircraft Beverley and the introduction of D.H. Comet 2s for special duties.

It must be recognized, of course, that though the Beverley is a trooper in its own right (and one of exceptional capacity when operating over relatively short ranges), it is primarily a tactical freighter and heavy-dropper, possessing neither the speed nor the range for strategic troop-carrying of the sort for which the V.1000 was—and the Britannia now is—intended. Where this Jumbo of an aeroplane really scores is in its ability to lift the most awkward and bulky loads without fuss and to set them down in rough country—including the sort where an elephant himself would feel at home. It is this ability which in recent days has allowed some overdue reinforcements to be shipped out to Cyprus in short order. Nor were these drawn from the traditionally long-suffering P.B.I. They were, in fact, four Service-type helicopters—three Bristol Sycamores and one Westland Whirlwind; and though such an operation might be regarded in the U.S.A.F. as old stuff (which it is), the carrying of a Whirlwind is certainly not kid stuff, in any man's language.

Future emergencies can well be imagined where the delivery of a force of helicopters or of light aircraft could bring about faster, more decisive, and infinitely more economical results than could several companies of soldiery; and where ground forces were already committed such aircraft could do much to alleviate the infantryman's lot in terms of "P" and "B." From Cyprus, indeed, comes news that a little force of Austers, with light-series bomb-carriers, is standing by.

How gratifying it must be to the Army commanders to know that they can count upon the rapid deployment of specialist forms of air support; and how satisfying to R.A.F. Transport Command that for heavy tactical delivery they now have call on such a willing, gentle giant as the Beverley.

FROM ALL QUARTERS

New Fares to the New World

THE eagerly awaited announcement on transatlantic air fare reduction has now been made by the I.A.T.A. conference at Cannes. Provided that the Governments represented at the conference agree, a 20 per cent cut in tourist fare for a 15-day return trip will be made next October, followed by a 10 per cent reduction in first-class fares in April 1957, when a *de luxe* class costing more than the present first-class fare will also be introduced.

A "high-density low-fare" tourist class will be started a year later, in April 1958, and will reduce the cost of a twelve-month return ticket between London and New York from £186 to about £148. An additional innovation is a special emigrant fare which will be offered between November 1 and March 31 for traffic to the U.S.A. and Canada from various European countries. A reduction of 40 per cent on the normal one-way tourist fare will be made.

Italian Inauguration

MARKING the official inauguration of Rome's new airport at Fiumcino—to be completed and opened to air traffic in 1959—Italy's first large-scale air display since the war attracted 200,000 spectators last Sunday.

British, American, French, Belgian, Spanish and Italian pilots provided aerobatic demonstrations. From the United Kingdom came No. 43 Squadron's aerobatic team (leader, F/L. Peter Bairsto) who gave an eleven-minute display with their Hunters. We hope to report the occasion in more detail later.

Migs Might Fly

SOME of the Soviet Union's latest fighters may take part with NATO aircraft at the Nuremberg air show next month, according to a German Aero Club spokesman. He quoted the Russian Embassy in Bonn as saying that the Soviet aircraft would come if the United States Air Force agreed. But U.S.A.F. headquarters at Wiesbaden said it was for West Germany to grant or deny such permission. Britain, the U.S., France and Italy have agreed to take part in the show.

Rundflug Revived

THE West German Minister of Transport, Dr. Hans-Christoph Seebohm, last weekend gave the signal to start the 1956 round-Germany air contest from Bonn-Hangelar. Seventy-one aircraft are taking part, divided into three classes, the event ending at Stuttgart next Sunday, July 1. This is the first time the "Rundflug" has taken place for 18 years. In pre-war days it was one of the best-supported occasions in the German aviation calendar.

NATO in Iceland

THREE reasons why Keflavik had been made a NATO air base, under an agreement with the Icelandic Government, were given recently by General John W. White. Gen. White, who is NATO Commander in Iceland, said that the base existed to defend Iceland, to provide early warning of naval and air activities in the North Atlantic, and to provide support for NATO's air and naval forces.

Gen. White, who was speaking at a Press conference, said in answer to questions that Keflavik lay on the Great Circle course from Leningrad to New York. If necessary it could accommodate aircraft of Strategic Air Command. It could not be "put into mothballs" and taken out quickly enough to be of any use to NATO.

At present it had operational squadrons of the U.S. Navy and Air Force, whose survey of the air and sea round Iceland was "continuous and effective." A squadron of F-89 fighters investigated every unidentified aircraft approaching the island and the Navy kept note of every ship in the area.

Gen. White is subject to the operational command of Vice-Admiral J. W. Cuthbert, R.N., NATO Commander in the North Atlantic, and of A.V-M. P. D. Cracroft, NATO air commander for the same area. Their headquarters in Scotland are in turn subordinate to Vice-Admiral Sir John Eccles and Air Marshal Sir Bryan Reynolds at East Atlantic headquarters in Middlesex.

Avon, Tyne, Conway

IT was confirmed in the chairman's statement accompanying the Rolls-Royce accounts, issued in advance of the annual general meeting, that the English Electric P.1 fighter will be fitted with Rolls-Royce Avon turbojets. The same document disclosed that the accounts (for the year ended December 31, 1955) show a group profit of £2,129,372 after taxation (1954, £1,968,818).

Other Rolls-Royce news is that the first Tyne turboprop "flight engine" was despatched from Derby to Hucknall early this month for installation in the nose of an Avro Lincoln which will serve as a test-bed (photograph on this page). A 150-hour test, to type-test schedule, has already been completed.

Latest news of the Conway is official confirmation of the existence of an engine designated RCo.8.

"Dovrefjell" Awards

TWO Naval helicopter pilots, Lt. J. R. Palmer and Senior Commissioned Pilot R. H. Williams, both of H.M.S. *Fulmar*, have been appointed M.B.E. for their part in the rescue of 41 sailors from the Norwegian ship *Dovrefjell* which struck a reef in the Pentland Firth on February 3. Commendations for brave conduct have been awarded to their aircrewmen, Acmn.1 A. Japp and A.P.O. Teleg. R. Moneypenny, both also of H.M.S. *Fulmar*. The citation in the *London Gazette* recalls how in a 45-kt gale the *Dovrefjell* was lying beam-on to seas breaking heavily over her. Solid spray was reaching up to 100ft and lifeboats were unable to get alongside:—

"Lieutenant Palmer and Senior Commissioned Pilot Williams were ordered to fly to the ship for possible rescue operations. S/C/P Williams arrived first but was ordered to turn back as conditions appeared to be too hazardous for helicopter rescue.

LOW DUMP: The Auster Agricola dumping 11 cwt of basic slag on its second emergency jettison-test. The entire load was jettisoned in spectacular fashion in five seconds.

LINCOLN-UPON-TYNE: The Rolls-Royce Tyne turboprop which, as reported in a news item on this page, has been installed in an Avro Lincoln flying test-bed at Hucknall.

RELEASED (like the braking parachute on the right) are these two new views (one is in the heading picture opposite) of the first prototype English Electric P.1. Recent tests have included supersonic gun-firing sorties.

"Lt. Palmer then reached the ship and, on his own initiative, decided to attempt a rescue. The ship's aerials and turbulence necessitated winching the men from a height of 50ft, but in spite of this Lt. Palmer succeeded in rescuing two of the crew. He was then joined by S/C/P Williams and during the next three hours both pilots made a total of eight trips between the ship and John o' Groats, rescuing two men each time.

"Lt. Palmer and S/C/P Williams displayed skill and determination of a very high order in rescuing the ship's crew in such difficult flying conditions."

Attackers Attacked

THE United States Air Force is to use some of its obsolete aircraft as targets for rockets, small guided missiles and 20 mm and 30 mm projectiles. Targets will include some 111 B-29s and 50 early versions of the F-84F, originally due to be scrapped.

Production Interchange

TWO French concerns, Fouga and S.N.C.A.N., have announced contracts for building German aircraft in France and French aircraft in Germany. S.N.C.A.N. is to sign an agreement with the Nordflug company under which Germany will build 117 Nord 2501s and buy 20 of the same type. Fouga will build Do27s under licence. The Heinkel and Messerschmitt companies will build Fouga Magisters for the German Government.

Supersonic Sled

A SLED powered by two sets of rockets has set up a "world's speed record of 1,560 m.p.h. for recoverable sleds" at Edwards U.S.A.F. base, California. The sled, powered by one set of five rockets which takes it up to 600 m.p.h. and another of seven for higher speeds, operates on a 10,000-foot track. It was specially designed by Convair to test rain erosion on aircraft and missiles at supersonic speeds, and in its run carried an exposed aircraft part through a 1,200-foot-long spray of water.

Indian Additions

THE Indian Air Force is to be augmented by 125 French and possibly by some British aircraft. An agreement has been signed by India with France for the purchase of 110 Dassault Mystère 4s (plus 15 Mystères described as trainers) for the I.A.F.

Meanwhile India's Defence Secretary, Mr. M. K. Vellodi, is visiting Europe and while in Britain plans to discuss the agreement his government hopes to conclude to manufacture Gnats in India. He intends also to have on-the-spot discussions about the purchase of Canberras. Senior I.A.F. officers who have preceded Mr. Vellodi to the U.K. have been asked to submit a report to him.

Pilotless V.T.O.

THE Piasecki Aircraft Corporation announces that the United States Navy Department has awarded it a contract to build what is described as "an experimental vertical lift aeronautical development nicknamed the 'Sea Bat.' "

Mr. Frank N. Piasecki, president of the company, has said that the Sea Bat will be unmanned and completely automatic in flight, controlled electronically from shipboard or land bases. Its compactness will permit its operation from restricted areas aboard small warships and it can be stowed on submarines.

It is claimed that the Sea Bat will perform a multitude of missions which cannot now be undertaken by existing aircraft or helicopters. The new concept, it is stated, will literally "hang in the air" like a bat, dart in any direction, hover close to the sea's surface and return to its operational base under complete control.

"FLIGHT" NEXT WEEK

As already announced in some detail (*Flight*, last week, page 795), next week's issue, dated July 6, will be a greatly enlarged special number. Under the title "Airliners of the World" it will describe and illustrate, with a unique collection of large cut-away drawings, the airliners that will dominate the air transport scene in the years ahead. Demand for this issue is likely to be heavy, so we suggest that advance orders be placed with newsagents.

Next Year's Paris Show

THE 22nd International Air Show will take place next year in the exhibition hall at Le Bourget between Friday, May 24, and Sunday, June 2. A plan providing for a regular helicopter service between Paris and the airport is under study.

Admiral E. J. King

FROM America comes news of the death—in hospital at Portsmouth, New Hampshire—of Fleet Admiral Ernest J. King, former Commander-in-Chief of the United States Fleet and Chief of Naval Operations. He was 77.

Admiral King was a specialist in all forms of warfare. After warship service in the First World War he transferred to submarines. Later, when nearly 50, he learned to fly, and his belief in the value of aircraft dictated much of his strategic policy. He became Commander-in-Chief soon after the U.S. entered the last war. Though he opposed British co-operation in the Pacific, it was his brilliant determination to avenge Pearl Harbour which contributed largely to victory there.

The Duke sees Swedish Air Force

THE hitherto secret underground hangars at the Royal Swedish Air Force fighter station of Tullinge near Stockholm were in part shown to the Duke of Edinburgh on his tour of inspection during his recent visit to Sweden. The Duke was greatly interested (writes a correspondent) and put numerous technical questions to Maj. S. Lampell, officer i/c hangars. For the first time, too, a party of selected foreign journalists were allowed into the hangars; we were escorted through them by Capt. Björn Holmbäck, station adjutant; F/L. Ullman, assistant adjutant; and a member of the Swedish Women's Royal Air Force. The hangars, which have several exits, had been blasted out of the solid rock, and though at no great depth underground are almost certainly impregnable against any conventional attack except perhaps a chance skip-bomb down the entrance ramp. The underground hangars are brick-lined, brightly illuminated and resemble ultra-modern bus-depot workshops. Sections were curtained and blocked off from our view.

On Saturday morning, June 16, the Duke of Edinburgh, accompanied by G/C. R. S. Ryan, C.B.E., the British Air Attaché to

WITHDRAWN from East Germany, if not from service with the Soviet Air Force, are these Il-10 ground-attack two-seaters. Their recent departure from Brandenburg is referred to in a leading article in this issue and in a news item on page 834. The machine on the right has no dorsal gun and appears to be a trainer.

FROM ALL QUARTERS . . .

Sweden, drove to Tullinge Air Force Station, a half-hour car journey from the Swedish capital, and was welcomed by the station commander, Maj-Gen. Tore Rapp. The inspection of the colour party (with the standard of the F.18 Fighter Wing borne by F/L. Karl-Erik von Heland and the guard of honour—armed with Husquvarna automatics—commanded by G/C. Allan Wiren) took place in a hangar, for a persistent drizzle had set in. During the inspection ceremony, Air Force music was played by the bands of the Bråvalla and Skaraborg Wings. The Duke wore Air Marshal's uniform and full decorations, the R.A.F. blue contrasting markedly with the navy blue uniforms and the peaked white summer caps of the Royal Swedish Air Force.

After the initial ceremony the Duke and G/C. Ryan were driven to the underground hangars, which are about a kilometre from station headquarters. Subsequently a scramble of the F.8 Fighter Wing was staged. The Saab J29 "flying barrel" fighters, with engines already running, were towed from their underground berths by large jeeps; the cable was slipped by each driver and the jeep moved quickly to the left, whereupon the fighter was ready for its take-off run. The wing was airborne in 2 min 45 sec.

The Duke of Edinburgh then went to an ordinary hangar where models of machines in current use by the Swedish Air Force were on view. These included the Hawker Hunter, which is a recent addition to Sweden's considerable fighter strength, the J29, the Saab SK50 trainer and the A32 Lansen (two-seater all-weather attack aircraft, with cannon, bomb and rocket armament). Showing great interest in this aircraft the Duke inspected it at length and put questions to the pilots. No. J35 Draken was on view.

Cloud descended to 100 metres and visibility was only 1,500 metres, so the extensive air display to be staged for the Duke was cancelled. After lunching at the officers' mess he returned to Stockholm by car.

Sweden is pursuing a course of armed neutrality and is rigidly refraining from allying herself with any power bloc; her Air Force is her most modern and powerful service and is capable of doing considerable damage to an invader from whichever side he might come. It is a tactical force, with its strength in fighter defence. Ten day-fighter groups and one night-fighter group are the bulk of this strength, and a 50 per cent increase in the number of day-fighter aircraft is under way.

The day-fighter force is at the moment mainly equipped with J29s which, though they can exceed 1,000 km/hr, are shortly to be replaced by J35s. The strength of the four groups of light tactical ground-attack aircraft is going to be increased by 25-50 per cent in the near future; during this year and next they will be equipped with the A32 Lansen.

Five reconnaissance squadrons, several training units, a tactical and reconnaissance photographic centre and various training centres complete the strength of the Royal Swedish Air Force. Sweden is having some difficulty in getting the right sort of people for jet pilots as most university students seem to have a strong preference for technical or business careers; it is difficult, also, to get sufficient suitable radar personnel.

Hunter Information Bureau

THE Dutch Government has set up a "Hunter Bureau" as a controlling body for all work done on Hunters being built under licence in Holland. Thus only rarely do problems have to be referred to the parent company, Hawkers, in this country. Hunters, which have already earned £124 millions (mainly in dollars) for Britain, are also built in Belgian factories. Parts or semi-fabricated components, such as inspection panels, are often made in another country—Great Britain or Belgium or Holland. As they are assembled into the aircraft immediately they are unpacked their manufacture calls for a high degree of dimensional accuracy.

Aird Whyte Trophy Winners

FOR the third time, No. 120 Squadron (W/C. P. R. Casement, D.S.O., D.F.C., A.F.C.), R.A.F. Coastal Command—top war-time U-boat "killer" unit in the Service—have won the Aird Whyte bombing and gunnery trophy. A silver bowl, this is awarded annually to the squadron with the highest aggregate score based on operational submarine-attack techniques. Based at Aldergrove, Northern Ireland, and now equipped with Avro Shackletons, No. 120 Squadron destroyed during World War 2 sixteen enemy U-boats and shared in the sinking of three others.

Air Marshal Sir Bryan Reynolds, Air Officer Commanding-in-Chief Coastal Command, presented the trophy to W/C. Casement at his headquarters in Northwood, Middlesex, on June 25. Mrs. A. C. Whyte, who gave it in 1951 for competition within the Command in memory of her son, Sgt. N. F. Whyte, watched the ceremony with her husband.

No. 206 Squadron (W/C. J. Preston) of St. Eval, Cornwall, were runners-up.

A NEW RESCUE/TARGET-TOWING LAUNCH

AN experimental high-speed rescue/target-towing launch, 2762E, powered by a pair of Rolls-Royce Sea Griffon Mk 101 engines and with an all-welded aluminium hull, has been built by Vosper, Ltd., of Portsmouth, and subjected to extensive trials. The project originated when Vospers, as a design firm to the Ministry of Supply for fast launches of the air/sea-rescue type, were entrusted in January 1952 with the design of a 68ft vessel primarily to act as a floating test-bed for the first pair of Sea Griffon 101 engines. These units were being developed by Rolls-Royce, Ltd., for marine applications on behalf of the Ministry of Supply.

Whereas most A.S.R. launches in the past have had wooden hulls, that of 2762E has framing, longitudinals, bulkheads and bottom section of Argonarc- and Argonaut-welded aluminium, while the skin above the hard chine is of Fibreglass moulded by Helematic, Ltd.

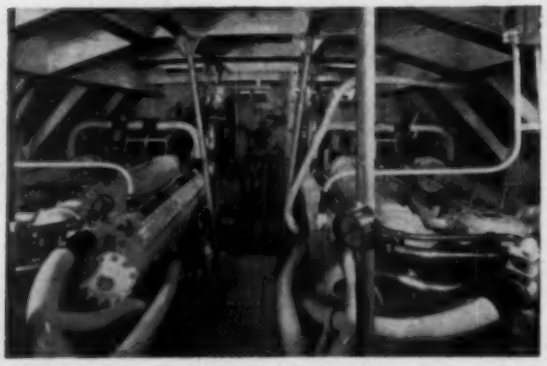
The Sea Griffon 101 engine is a development of the aero Griffon 57 (which was the standard power unit of Spitfires Mk 14 to Mk 22). The main body of the 57 unit, including combustion components, has been used, with the airscrew reduction gear replaced by a reversing gearbox. Basically, the engine is a 12-cylinder 60 deg vee of 6in bore and 6.6in stroke, giving a total swept volume of 37.7 litres. Maximum power output is 1,450 b.h.p. The units are fresh-water-cooled with sea-water-cooled heat-exchangers.

Transmission is through vee drives with a reduction ratio of 1.54:1. Three tanks situated immediately forward of the engine room carry a total of 2,220 gallons of fuel.

Accommodation is conventional for craft of this type, incorporating a forecastle for eight men, with galley; sickbay with accommodation for six stretchers; and commanding officer's cabin, on the main deck. A W/T. office is located at the after end of the superstructure.

In addition to items already mentioned, structure and equipment includes Simmonds Pacitor fuel gauges, Flylite flexible piping, Bloctube controls, Metalastik flexible couplings, Pren cables, Smiths space heater, Decca radar and SARAH search equipment.

The new Vosper launch at speed; she has attained 40 kt during her trials. The interior view shows the two Sea Griffon 101s.



WORLD GLIDING CHAMPIONSHIPS

63 Competitors from 27 Countries

THE World Gliding Championships begin tomorrow, June 30, and continue until July 12. The contests have been held in alternate years since 1948—first in Switzerland, then in Sweden (1950), Spain (1952) and England (1954). Philip Wills became world champion in 1952, and the British Slingsby Sky sailplanes dominated the Championships. In 1954, at Bradwell Edge, Derbyshire, rain all but ruined the contest. Wills finished second to France's young Gérard Pierre.

This year, France is the host, and no fewer than 27 nations have entered 63 pilots to represent them at St. Yan, on the Loire in Central France. Seven nations are represented for the first time. The U.S.S.R. is not competing, but Poland, Hungary and Czechoslovakia represent the countries of Eastern Europe. Japan, New Zealand and Turkey are also newcomers, and the Saar has entered Ernst Frowein, who has previously flown for Germany (what about it, Wales?). Fifty of the sailplanes are single-seaters and 13 are two-seaters. These will compete in separate competitions, although the tasks will be of the same kind for each class—races round a closed circuit, or to a goal and back again.

The Teams. Hanna Reitsch (Germany) and Philip Wills both competed in the first World Championship in 1937, and Wills has not missed one since. In addition, two of this year's pilots flew in 1948 and another two in 1950. The British team again have Wills and Stephenson as their solo representatives, but Nick Goodhart and Frank Foster are to fly the two-seater. Nick is new to World Championship flying but holds the British height record and the first British Diamond Badge. Frank Foster flew in Spain and is again relinquishing B.E.A.'s Elizabethans for Slingsby's slower aircraft. Mrs. Ann Welch is team captain.

In the last contest, the British team flew a Slingsby Sky, Elliott Olympia IV and Slingsby T.42. This year they have two Slingsby Skylark 3s and a much-modified T.42. Once again the team will be well equipped, owing to the generosity of Standard (Vanguard cars), Normalair (lightweight oxygen equipment), Pye (radio) and others. The financial problems of sending a team overseas have been relieved by the magnificent S.B.A.C. donation of £1,000.

The brother of Nick Goodhart, Tony Goodhart, now serving with the Royal Navy in Australia, is the lone Australian entry and has been lent a French Bréguet 901. He now holds the world speed record for the 300 km triangle—the first world gliding record a Briton has held for twenty years.

Canada is fully represented. Frank Brame, who was C.F.I. of the College of Aeronautics Gliding Club while a student at Cranfield, will be back in Europe to fly for them. Dick Georgeson, of New Zealand, who bought Wills' Weihe and flies it there, is to borrow a French Air 100, and South Africa is once again to be represented by Helli Lasch—his fourth World Championship.

The Gliders. British sailplanes are being flown by several teams in addition to our own. Our good customers, the Dutch, will have two Skylark 3s, and Spain will have two Skys. The Elliott Olympia IV, which has been increased in span since 1954, is to be flown by Bill Ivans (U.S.A.), the holder of the world height record for gliders (42,100 ft).

Thirty-two different types of sailplane are competing, more than half of which have not been seen at a World Championship before. Such details as are known are listed in the table, and it will be seen that gliding angles of 1 in 35 or more are now common. This is attributable to the use of laminar wing sections with wing spans of about 18 metres (59ft).

St. Yan (village population, 250) is the home of the French School of Aerobatics, and its pilots will do the glider towing, using 20 Stampes as tugs.

OSTIV. The sixth Congress of OSTIV, the international scientific and technical organization of gliding, will take place at St. Yan from July 7 to 13. Among the subjects down for discussion are the design of the Skylark and Bréguet series, the French and American pressure-cabin sailplanes for high-altitude flying and the problem of a restricted competition class. Plastics, compressed wood, variometers and pilot training are also the subject of technical papers.

A. H. Y.

THE SAILPLANES

Type	Country of Design	Span (m)	a.u.w. (kg)	Glide Ratio
Single-seaters:—				
Sky	Great Britain	18.0	363	30
Skylark III	Great Britain	18.0	360	32
Olympia IV	Great Britain	16.8	354	36
Weihe	Germany	18.0	335	29
Meise	Germany	15.0	300	26
Zövogel	Germany	16.0	345	34
Air 100	France	18.0	337	30
Bréguet 901	France	17.3	415	35
WLM II	Switzerland	18.1	—	—
Elfe III	Switzerland	16.0	—	35
Orao IIc	Yugoslavia	19.0	455	37
Jasolka	Poland	16.0	330	27
B.N. 1	Brazil	16.7	—	—
Pik. 3	Finland	13.0	230	26
Also: WSM 40 Demant (Czechoslovakia), A.08 (Hungary), Eolo (Italy), Mg. 23 (Austria) and Geier I.				
Two-seaters:—				
T.42b	Great Britain	17.8	545	31
Condor IV	Germany	18.0	450	—
Kranich III	Germany	18.3	430	27
HKS. 1	Germany	19.8	580	—
Canguro	Italy	19.2	—	—
Schweizer 2-25	U.S.A.	18.3	508	30
Kosava	Yugoslavia	19.1	562	33
Bréguet 904	France	20.0	630	37
Musger Mg. 19c	Austria	17.6	—	—
Also: Bergfalke (Germany), Super-Canguro (Italy), Bocian (Poland), and L.13 (Czechoslovakia).				

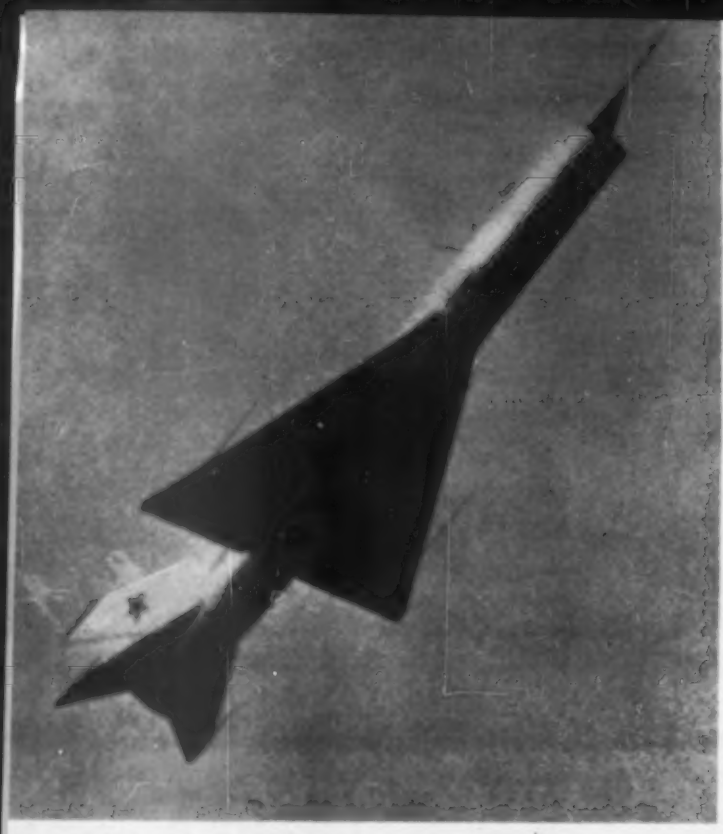
A pleasing impression of the French Bréguet 901. Seven are competing; Tony Goodhart, flying for Australia, will use one.

ENTRIES

Argentina.—José Ortner (——), José Cuadrado (——), Sadoux and C. J. Dori (Condor IV).
Australia.—Tony Goodhart (Bréguet 901).
Austria.—H. Resh (Mg.23), L. Harrer (Mg.23).
Belgium.—Marcel Cartigny (Jasolka), Jean d'Otreppe (Air 100).
Brazil.—George Münch (B.N.1), Aldo da Rosa (B.N.1).
Canada.—J. W. Ames (Bréguet 901), Frank Brame (Geier 1), Albie Pow and Oates (Bergfalke).
Czechoslovakia.—J. Hollan (WSM 40 Demant), J. K. Kumpos (WSM 40 Demant), Sebasta and Janek (L.13).
Denmark.—Aksel Feddersen (Olympia-Meise), A. D. Thomsen (Olympia-Meise).
Finland.—J. Jalkanen (Pik. 3), K. Heininen (Air 100), Ossermayer and Kunz (Mg.19c).
France.—Gérard Pierre (Bréguet 901), René Fonteilles (Bréguet 901), Guy Rousselet and Louis Trubert (Bréguet 904).
Germany.—August Wiethüchter (HKS.1), Hanna Reitsch (Zövogel), Ernst Günther Haase and Knieper (Kranich III).
Great Britain.—Philip Wills (Skylark 3), Geoffrey Stephenson (Skylark 3), Nicholas Goodhart and Frank Foster (Slingsby T.42b).
Hungary.—G. Mezo (A.08), L. Kaemar (A.08).
Israel.—Menachem Bar (Air 100), Arber (——).
Italy.—G. Ferrari (Eolo), Adriano Montelli (Canguro), Riccardo Brigliadori and Tomasina (Super-Canguro).
Japan.—Isamu Oda (Bréguet 901).
Netherlands.—Otto P. Koch (Skylark 3), W. Toutenhoff (Skylark 3).
New Zealand.—Dick Georgeson (Air 100).
Poland.—Edward Makula (Jasolka L. Swallow), Jerzy Popiel (Jasolka L. Swallow), Julian Nowotarski and Sliwak (Bocian Z Stork).
Saar.—Ernst Frowein (Kranich III).
South Africa.—E. Domisse (Bréguet 901), Helli Lasch (——).
Spain.—A. Torrell (Sky), I. V. J. Gomez (Sky), Valetta and Llorente (Kranich III).
Sweden.—Per Axel Persson (Weihe), Irve Sileamo (Bréguet 901).
Switzerland.—Hans Nietlispach (Elfe III), N. Dubs (WLM II).
Turkey.—Z. Argun (Air 100), E. Subasi (——), Yaykin and Uygun (——).
United States of America.—Paul MacCready (Bréguet 901), Bill Ivans (Olympia IV), Kemp Trager and Miller (Schweizer 2-25).
Yugoslavia.—Bozidar Komac (Kosava), Max Arbaiter (Orao IIc), Zvonimir Rajn and Stepanovic (Kosava).

TUSHINO REVELATIONS

Sukhoi Supersonic Deltas in a Great Soviet Display



FLYING event of the week was the Soviet Air Force's profoundly impressive demonstration last Sunday, at Tushino military airfield, near Moscow, attended by the British Secretary of State for Air and British, American and other senior officers and officials.

On the previous evening prominent personages had broadcast, among them Colonel General of the Air Force Rubanov, Lieutenant General of the Air Force Kurtsevalov, and helicopter specialist Nikolai Ilyick Kamov. Col-Gen. Rubanov had said that the Soviet aircraft industry had already solved "even such problems as the creation of V.T.O. aircraft and the design of nuclear power-plants"; and in the very near future Soviet aviation would possess a four-jet airliner. Lt-Gen. Kurtsevalov claimed that the Soviet Air Force possessed guided missiles and he also revealed that the 20th Congress of the Communist Party had stipulated that during the next five years Aeroflot should increase its carriage of freight five times and its passenger traffic 3.8 times. Many new routes would be inaugurated, and numerous airports modified to take the latest Soviet airliners. Nikolai Kamov referred to a number of helicopters, including the tiny Ka-10M "flying motor cycle."

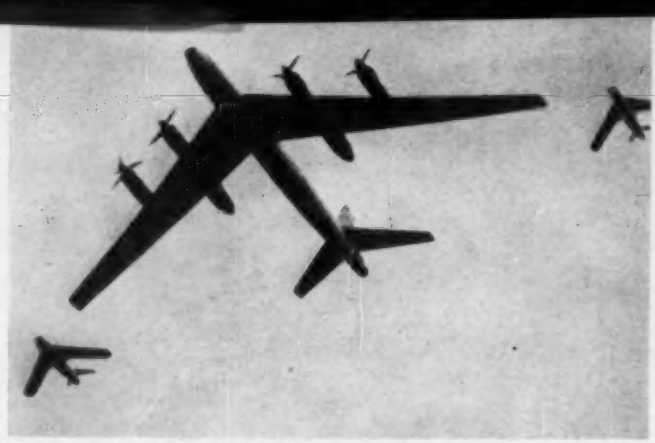
The great day itself was dull and gusty, with raincloud at about 4,000ft, but with occasional bright periods and generally good visibility. Describing the Tushino scene a Moscow Radio aviation expert said that not only was the airfield itself packed with spectators, but for miles around thousands more were seated by the roadside, on farm wagons and on rooftops. Attendance at Tushino proper was of the order of 200,000 and in all some 500,000 must have watched the flying.

Seated outside the premises of the Central Aero Club ("named after the great flier Valery Chkalov, who brought fame to his country in 1937 by his brilliant non-stop flight from Moscow across the North Pole to the United States") were leaders of the Communist Party and of the Soviet Government, together with Marshals of the Soviet Union and Air Marshals.

Twenty foreign nations were represented—from Afghanistan (Col. Abdul Razak), through the "People's Democracies," to the United States and Great Britain (whose presence, though mentioned, received no special comment). The British delegation was headed by the Secretary of State for Air, Mr. Nigel Birch, and had left London Airport on the previous day, June 23, in a de Havilland Comet 2 of No. 216 Sqn., R.A.F. Transport Command. The Comet had landed at Vnukovo Airport, Moscow, and had drawn from Chief Marshal of Aviation Zhigarev the comment, "It is just as beautiful as our plane" [meaning the Tu-104]. Flying time was 4 hr 2 min (it had been estimated to take 3½ hr), and the route was *via* the Berlin and Warsaw air corridors. W/C. Sellick, officer commanding No. 216 Sqn., was himself piloting the Comet.

Accompanying the Secretary of State were Col. Konstantinov, Soviet Air Attaché in London; Air Chief Marshal Sir Ronald Ivelaw-Chapman, Vice-Chief of the Air Staff; Air Marshal Sir Thomas Pike, Deputy Chief of the Air Staff and A.O.C-in-C. Designate, Fighter Command; Air Marshal Sir Harry Broadhurst,

(Top left) One of the new Sukhoi supersonic deltas. (Centre) Mr. Nigel Birch and Air Chief Marshal Sir Ronald Ivelaw-Chapman in Moscow with Marshal Ivan S. Konev and Marshal Zhigarev. (Left) The Comet 2 used by the R.A.F. delegation, seen before leaving London Airport.



The great bomber seen above with two Mig-17s is one of the four-turboprop machines known in the Allied nomenclature code as Bear. In all, four of these flew past. On the right are Mi-4 helicopters departing from their mobile cargoes after an assault landing.

A.O.C-in-C. Bomber Command; A.V-M. W. G. Cheshire, A.O.C. No. 13 Group, Fighter Command; A.V-M. K. B. B. Cross, A.O.C. No. 3 Group, Bomber Command; A.V-M. G. Silyn-Roberts, S.T.S.O., Bomber Command; G/C. F. E. Rosier, Fighter Command Planning Staff; and G/C. L. M. Hodges, O.C. R.A.F. Marham, Norfolk (the Valiant bomber base visited by Mr. Bulganin and Mr. Krushchev when they were in England).

Representing the Ministry of Supply and the British aircraft industry was a party led by Dr. W. Cawood, Director-General of Scientific Research (Air), Ministry of Supply, and including Dr. A. E. Russell and Dr. G. S. Hooker, directors of the Bristol Aeroplane Co., Ltd.; Mr. George Edwards, managing director of Vickers-Armstrongs (Aircraft), Ltd.; Sir Arnold Hall, technical director of the Hawker Siddeley Group; Mr. G. W. H. Gardner, Director of the Royal Aircraft Establishment, and Mr. D. W. G. L. Haviland, Under-Secretary, Ministry of Supply. Mr. Reginald Maudling, Minister of Supply, had been invited, but was not able to accept owing to pressure of Ministerial business.

The American contingent was led by General Nathan Twining, U.S.A.F. Chief of Staff, who was accompanied by nine officers, including Lt-Gen. Donald L. Putt, Deputy Chief of Staff for Development, and Lt-Gen. Thomas S. Power, Commander of the U.S. Air Research and Development Command. The Americans flew in a Douglas C-118 and Gen. Bailly, French Chief of Staff, also came by the old (piston-engined) means.

Sunday's proceedings were sounded in with the Soviet national anthem and a salute of guns, and were in three phases. The first of these opened with the appearance of Yak-12 liaison aircraft carrying the banners of the 16 Soviet Republics and streamers spelling out "Glory to the Soviet people"; these were followed by 76 Yak-18 trainers, spelling "Glory to the C.P.S.U." (Communist Party of the Soviet Union), the arrival of which was the announcer's cue to read a poem which could be translated as:—

With every minute the sounds of engines are approaching,
Experienced pilots maintain precise formation,
With a harmonious engine,
Rapidly move the planes . . .
In them are our pilots.
They are declaring in the sky: 'Glory to our Party!'
We are dedicating our life, every day and every moment to her,
In her we always find strength and inspiration.
The planes are flying in a formation,
The words resound: 'Glory be to the Party!'
And we follow them with our eyes,
And in the sky read what we have in our hearts.

The banners and streamers being clear, DOSAV, the all-Union sports organization, took over with light aircraft, gliders and parachutists. Aerobatics included a Soviet favourite, the follow-my-leader continuous loop, by 21 Yaks.

A jet fighter of unspecified type, flown by Major Lapshin, opened the second phase with more aerobatics, to be followed by a similar performance by Lt-Col. Iosif Pavlov; then a box formation of four jet fighters contributed more manœuvres, concluding with a series of cross-overs from the four points of the compass. At length came the bomber and fighter streams with a single turboprop Bear, escorted by a pair of Mig-17 fighters, in the lead. The main formation included four more Bears, three of the great four-jet Bisons, and nine twin-jet Badgers (Badger being the bomber counterpart of the Tu-104 transport). Sixty Farmer single-seat fighters, flying in fives, and 50 Flashlight twin-jet all-weather fighters, again in fives, comprised the fighter stream. Behind them came a Tu-104 transport, which received a great ovation and called forth the announcement that it is now being "mass-produced, and will soon find its way on to the international routes."

Last in this dramatic phase came "new Soviet aeroplanes, designed by Antonov, Tupolev, Yaklovlev, Mikoyan and Sukhoi," first among them being the Antonov twin-turboprop assault transport, later described by General Twining as "pretty fast," and compared by him to the Chase (Fairchild) C-123 of the U.S.A.F. (though the C-123 is piston-engined). This new Antonov has a high wing and is reported to be armed.

The Tu-104 having put in a second appearance, the fighter prototypes approached. "Here comes a strange-looking aircraft," proclaimed the commentator. "It looks like a glistening steel triangle, and it is followed by new jet aircraft led by the test pilot Grigory Alexandrovich Sedov. . . . Glory be to the Soviet designers who have created the best aviation equipment in the world."

Contradictory and garbled as are available reports, it is clear that the new deltas—of which there were three, ascribed to the designer Sukhoi, varying, it appears, in nose design—are extremely advanced aircraft indeed. Salient features are seen in the photograph on the opposite page. Note particularly the form of the intake; the nose cone, which might house all-weather radar; the retention of a dorsal aerial mast; the troughs in the fuselage sides near the wing roots; the "probes" in the nose, on the wings and on the tailplane; and the great diameter of the tailpipe, indicating a very powerful turbojet with afterburning.

Two more new fighters are described as enlarged versions of the Farmer (Farmer itself is unofficially reported to be designated Yak-25); and the parade of new types was completed by two developments of the all-weather Flashlight, one having a modified fighter-type nose, and another a transparent nose-cone, possibly indicating adaptation for the light-bomber rôle.

The third, concluding, phase of the proceedings consisted of parachute descents and the landing of airborne troops. Among the parachutists was Lt-Col. Ovysyannikov, who was that day making his 730th jump, and Maj. Sukhinin, who was making his 684th. Some of the Army parachutists were using small, rapid-descent canopies for increased accuracy.

Forty helicopters—four massive twin-rotor Yak-24s and 36 Mi-4s—made closely spaced mass-landings in spite of the gusts. They disgorged 22 lorries, which towed 12 field guns and four multiple anti-aircraft guns. One hundred and seventy-five steel-helmeted men were also deposited by this impressive assault force.

The flying display ended after 90 minutes.

That evening distinguished visitors were entertained to a dinner at the Soviet Army Club, attended by Marshal Bulganin and Mr. Krushchev. The following are some remarks attributed to various interested parties:—

Mr. Krushchev (replying to Mr. Birch's remark that the Soviet leaders had seen more bombers at Marham than had been shown that day): "Ah, but you tried to scare us. You plan where and whom to bomb. We plan our defences. . . ." [See also a leading article in this issue.]

"I assume that the Air Force visitors are eager to see Russia's rocket missiles. The Soviet Union would also like to see such weapons. We like things to be realistic, and we do not want to play a game of hide-and-seek. The leaders of the Soviet Government decided they would show you some planes. Show us your planes and we shall show you our rocket missiles."

Mr. Nigel Birch: "We liked your air show. . . . I thought that the formation flying was wonderfully good, particularly considering how difficult the weather was. I was also very impressed by the helicopter display at the end, and I thought that some of the modern types of aircraft looked very good for their job indeed."

Air Chief Marshal Sir Ronald Ivelaw-Chapman: "A magnificent demonstration of organization and timing."

Gen. Twining: "The finest-organized show I have ever seen. Timing was excellent and the skill of the pilots very superior."

Mr. G. W. H. Gardner: "Beautiful flying. The Russians have obviously got some very fine aircraft."

On the following day, at Kubinka Airfield, 40 miles from Moscow, the Western visitors were taken in cars past a line-up of every type of Russian operational military aircraft. Not previously seen were a twin-jet, swept-wing bomber of about Canberra size which, the Russians claimed, was supersonic. Another new type was a single-jet ground-attack aircraft, with armour plating under the fuselage. There was also a naval machine with extensive provision for external stores, and powered by one turboprop.

METEOR U.15: A new target version of the Meteor referred to in a paragraph below.

HERE AND THERE

And so we say Farewell . . .

THE Soviet Air Force in East Germany put on an impressive fly-past of 28 Mig-17s and a single Mig-15 at Brandenburg last week, to mark the "demobilization" of its 200th Ground-Attack Division and the beginning of a withdrawal of 33,500 members of the Russian armed forces from Germany. After the fly-past, 87 obsolete Il-10s lumbered off towards Poland. They are leaving Germany; the Migs are not.

Bigger Static Show

AT this year's Farnborough Show (September 3-9) the hall will be even bigger, to allow 338 companies—some 20 more than in 1955—to exhibit.

Capability Brown

A NAVAL pilot, Lt. Michael Brown, R.N., was commended by the Admiralty last week for a "very brave decision" in deciding to force-land his Hunter instead of abandoning it after a flame-out at 40,000ft above Plymouth on June 21. Lt. Brown, attached to No. 1 Squadron R.A.F., Tangmere, Sussex, landed the Hunter at R.A.F. Station Chivenor, North Devon, after gliding 60 miles in eight minutes. It was only slightly damaged, and he escaped with a broken ankle.

Target Meteors

THE picture at the top of this page shows a Meteor U.15, which is a conversion of a Meteor F.4, as the U.16 is a conversion of the F.8. Both the U.15 and U.16 are able to fly unmanned, under ground-radio control, for use as target aircraft. The conversion entails modifications to the flying controls and certain structural alterations to permit the addition of "specialized electrical instrumentation and radio equipment." The conversion scheme was devised by the M.o.S. and the actual transformation, together with mechanical design work, is the responsibility of Flight Refuelling, Ltd., at their headquarters at Tarrant Rushton, Dorset. In this work the company has collaborated with the R.A.E. and with other specialist firms.

A.V-M. H. V. SATTERLEY, Deputy Chief of the Air Staff (Operational Requirements), studies a Britannia's cockpit roof panel during a recent visit to Bristol.

New Air Attaches

SEVERAL changes in air attaché appointments have been announced. In Bonn, A. Cdre. G. F. A. Skelton, O.B.E., has assumed duty in succession to A. Cdre. A. A. Adams, D.F.C.; in Helsinki W/C. M. J. Gray, D.F.C., has taken over from W/C. A. Deytrikh, A.F.C.; in Moscow, A. Cdre. A. R. D. MacDonell, D.F.C. has succeeded A. Cdre. P. L. Donkin, C.B.E., D.S.O.; in Rome, G/C. J. L. Barker, C.B.E., D.F.C., has followed G/C. H. M. Pinfold; and in Saigon, W/C. W. H. Mills, D.F.C., has taken over from W/C. B. A. Colvin.

General Puget

THE French Air Attaché in London, Colonel Puget, has been promoted: he is now Général de Brigade Aérienne A. J. B. Puget, D.S.O.

Hunter Contract

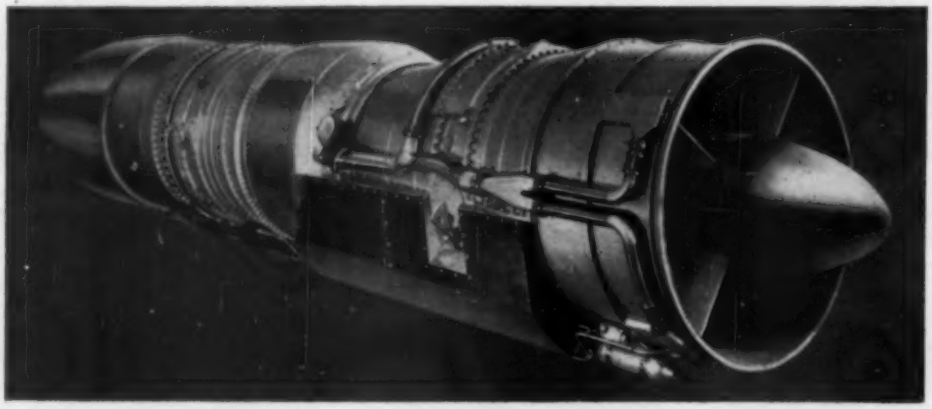
A FURTHER contract to build a large number of Hawker Hunters for the Belgian Air Force has been signed between the Belgian Minister of Defence, Avions Fairey of Gosselies and SABCA of Haren, near Brussels. The two companies are at present completing an earlier Hunter contract. The aircraft are built and test-flown by Avions Fairey and SABCA at Gosselies, near Charleroi, from components manufactured by SABCA and by Fokker in Holland. The Rolls-Royce Avon engines that power these aircraft are being built in Belgium by Fabrique Nationale d'Armes de Guerre.

Herons for Iraq

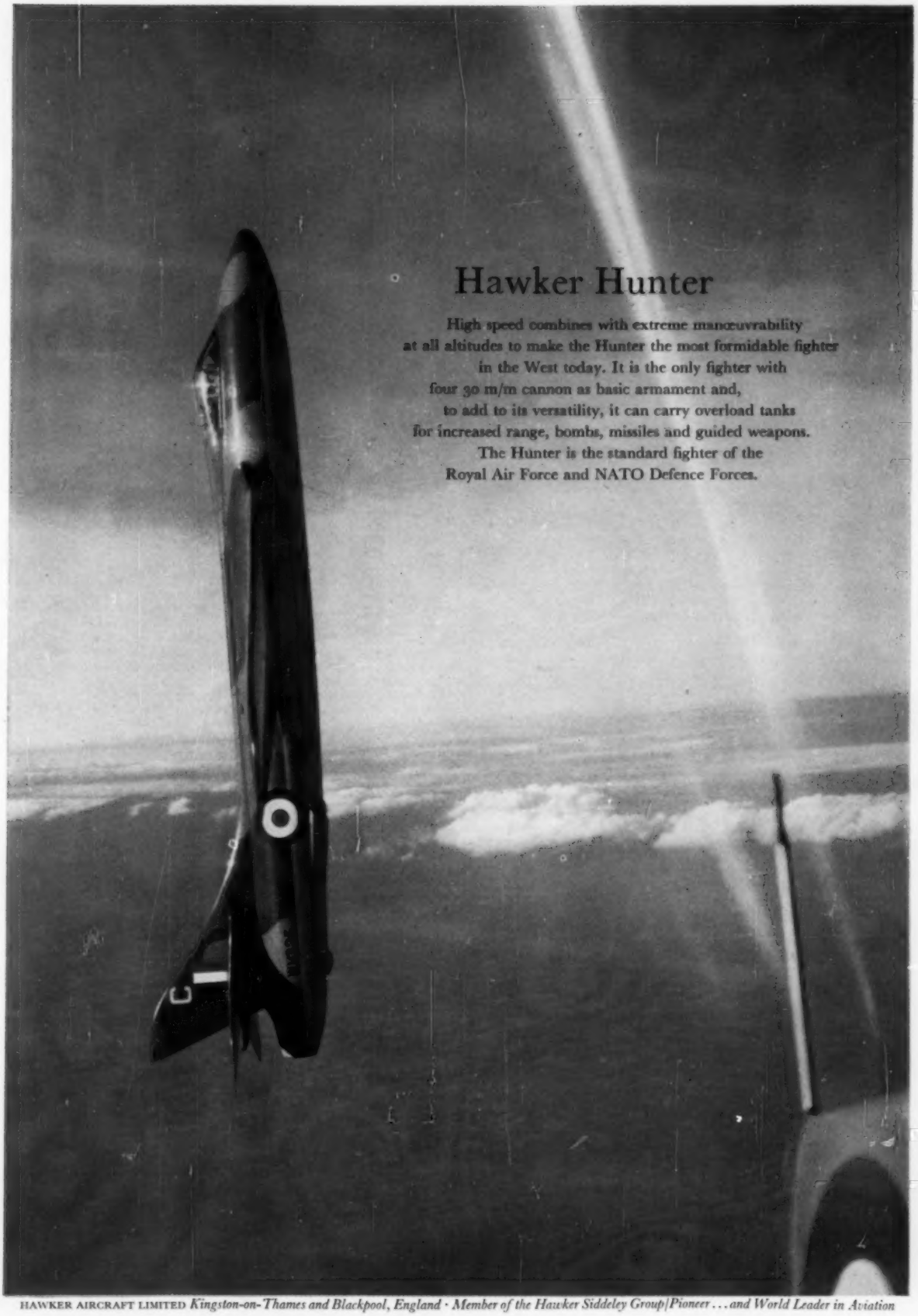
TWO de Havilland Herons have been ordered by the Government of Iraq for communications and transport duties with the Royal Iraqi Air Force. One is an executive version and the other a 14-seat airliner. The Herons, which are expected to be delivered this autumn, will join the D.H. Doves which have served the R.I.A.F. communications squadron for several years past.

Air-Britain Meeting

THE next meeting of the London Society of Air-Britain will take place on Wednesday, July 4, at 7 p.m., in the Kent Room, Caxton Hall, S.W.1. Two films will be shown, M.G.M.'s *Men of the Fighting Lady* and Republic's *Flying Tigers*. Hon. sec. of the Society is Mr. G. J. Pollinger, 39/40 Bedford Street, Strand, W.C.2.



INDIAN WARRIOR: A mock-up—convincing in appearance—of the recently unveiled Orenda Iroquois, designed for thrust figures in excess of 20,000 lb. Under the designation P.S. 13, this type of engine has been running for over a year at Malton. As announced last week ("Flight," p. 794) it will ultimately power the forthcoming Avro Aircraft CF-105.


Hawker Hunter
High speed combines with extreme manœuvrability
at all altitudes to make the Hunter the most formidable fighter
in the West today. It is the only fighter with
four 30 m/m cannon as basic armament and,
to add to its versatility, it can carry overload tanks
for increased range, bombs, missiles and guided weapons.
The Hunter is the standard fighter of the
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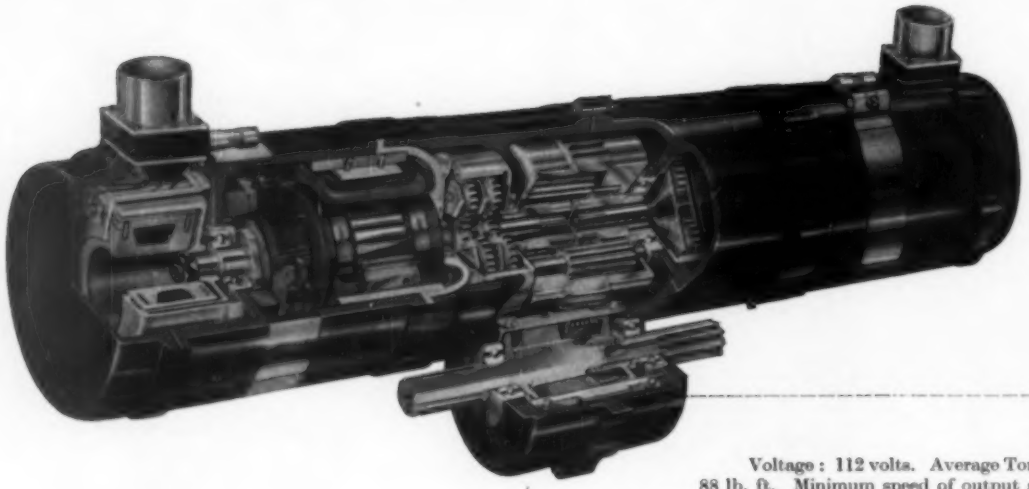

Voltage : 112 volts. Average Torque: 88 lb. ft. Minimum speed of output shaft at average torque (both motors driving): 146 r.p.m. Max. current draw in each motor at average torque: 18 amps. Mean setting of overload Clutch : 178 lb. ft. Rating : 60 secs. Operating temp. range : +50°C to —70°C. Operational ceiling : 50,000 ft. Mounting : strap. Electrical connection : two 5-pin Breeze plugs. Weight 31 lb. Length : 20.375". Height : 8.531". Width : 4.873".

Twin Rotary Actuators

. . . each motor is fitted with an electro-magnetic brake. The output shaft is driven through a differential gearbox, the design of the gearbox is such that, should one motor fail, no additional strain is imposed on the remaining motor, which continues to produce the full torque at half speed.

A single clutch is set on the overload shaft axis. The machine is totally enclosed.

Complete Electrical Systems for Aircraft

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Building a Turbi

Progress Report on the T.K. Flying Group's Project at Hatfield Technical College

Some of the group at work on the Turbi. Left to right, M. S. Rana, C. Batten (group chairman), T. J. R. Longley and N. F. G. Harrison. "Flight" photograph

THERE is at present no shortage of interest in the amateur construction of ultra-light aircraft. What has been lacking until recently, however, is published information on the practical methods used and problems encountered once a group has commenced such a project. The construction of a Druine Turbi two-seater was begun last year by a group of students at Hatfield Technical College, who formed the T.K. Flying Group and became affiliated to the Popular Flying Association. Their progress up to a month ago is described here by T. J. R. Longley, honorary secretary of the Group. Details concerning the basic design and construction of the Turbi appeared in the article "Jodel D.112 and Druine Turbi" in "Flight" of April 8, 1955.

SINCE the ceremony of "laying the keel" was performed by Mr. Peter Masefield on March 26, 1955, work on the T.K. Turbi—the first amateur-construction project to be undertaken under the simplified system of supervision by the Popular Flying Association—has progressed steadily. The machine has now reached such a stage of completion that some of the lessons learned may be of interest to those who are either building, or contemplating building, a similar type of aircraft.

Progress to date has been such that most of the major headaches, experienced by the prospective builder when he first studies the set of drawings, have been successfully overcome. Each is discussed in turn in the subsequent notes.

At the time of writing, the fuselage is virtually complete, except for the engine installation, the fin having been built up, and the rudder completed.

As the group lacked the advantages of a wooden-floored workshop, the layout of the fuselage sides was marked on a concrete floor, using indelible pencil. Subsequent damping gave the lines sufficient contrast for accurate positioning of the longerons and spacing members. The former were held in place by means of slotted wooden battens weighted with shot-bags, while the spacing members were butt-glued in position.

The birch-ply panels which cover the entire length of the fuselage sides were next spliced together and glued and bradded to the framework, which, with battens removed, was sufficiently rigid to allow this operation to be completed without distortion taking place. Making the other side to match was a simple operation, effected by placing the new set of spruce members in position over those of the completed side, temporarily securing them with headless brads.

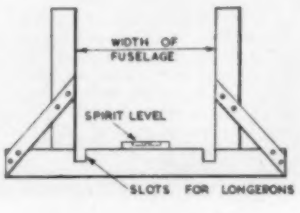
Assembly of the fuselage sides, which was carried out with the structure in the inverted position, was facilitated by the existence of a manhole in the floor, down which the fin post (which is an integral part of the fuselage) could be held in the vertical position by reference to a plumb-line. In plan view the fuselage has a straight taper from the fin-post to a point just aft of the rear cockpit position; to ensure "squareness" in the assembly, a wooden jig (Fig. 1) was made to support the fuselage sides at the forward end of the taper. By levelling the base of this jig, it was possible to ensure that the top of the fuselage would lie flat along its entire length, and that the fin post would be perpendicular to it.

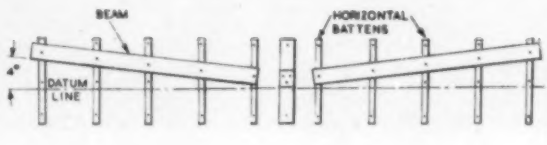
Spacing members were next inserted, and the rear-fuselage bottom panel glued in position. Further assembly of the fuselage was carried out by inserting as much as possible of the structure at the rear end, and gradually working forward, bending the sides inwards to obtain the required width. The mid-points of all horizontal spacing members were marked, to check that the fuselage was symmetrical about its datum, easily represented by a string stretched from the tail. As expected, the curved fuselage sides did not draw in evenly about the datum, but this was easily put right by clamping a narrow wooden plank to the side which tended to curve the most: by easing the pressure of the clamps, the amount of "yield" in the offending side could be accurately controlled. The final operation in bringing the sides together was to fit the front bulkhead, and a pair of borrowed sash-clamps proved very useful in overcoming the tendency of the sides to spring apart.

The curved ply top decking which bounds the cockpit opening threatened to present a certain amount of difficulty, but the problem was solved by the use of bungee cords—as sold for holding luggage on motor cycles! These were stretched over the ply, and hooked to loops in wires which were attached to lengths of wood passing beneath the fuselage. In places where the ply tended to spring clear of the structure to which it should have remained glued, additional local pressure was applied simply by slipping a small piece of waste ply or spruce under the bungee cord over the spot concerned. The necessity of using brads in a structure hardly suited to receive them was in this way entirely obviated when glueing the decking behind the rear seat-back, which forms the covering to the luggage locker (the photograph above shows the fuselage ready for this item to be attached). It is expected that this bungee-cord technique will be adaptable for use in fixing the ply leading-edge to the wing.

By far the most complicated job likely to be attempted was that of laminating the five 18ft lengths of 14mm × 60mm spruce which constitute each of the two booms of the wing mainspar centre-section. For this purpose two tables, whose surfaces were far from being flat, or even on the same level, were placed end-to-end. Wooden battens were then laid at intervals across the tables. By judicious use of lines, straight-edges, and spirit-levels, a flat surface was obtained by putting packing beneath most of the battens to bring them up to a common level. In this position they were screwed to the tables, the screws being deeply countersunk to allow for planing, which was used for a final adjustment to the common level.

Two large, straight wooden beams, each inclined at 4 deg to a straight datum line, were screwed firmly to the battens to provide a substantial base to which the laminations could be clamped to give the booms their dihedral angle (Fig. 2). The





Figs. 1 and 2. General arrangement of fuselage assembly jig and (right) spar-boom and spar assembly jig.

"Flight" photograph

Clamping up the spar-boom laminations. In the foreground is a rib which has just been removed from its jig; the latter can be seen at the far end of the table.

BUILDING A TURBI . . .

photograph above shows how the laminating operation was carried out. Clamping was commenced at the centre, and thereafter clamps were applied by two people, each one working outboard towards the tip. Two one-inch-thick planks were used to distribute the pressure of the clamps along the straight sections of the booms.

Indicative of the difficulty experienced before a satisfactory boom was made is the fact that the boom shown in the photograph was rejected, for two reasons. The first was that an unfilled gap was discovered between the laminations on the underside of the boom, and the second was that in places the laminations had become "stepped", and planing to remove this would have made the boom too narrow. Subsequent attempts were successful simply due to the fact that more care was taken to ensure that the clamps were applied "square" to the job.

A note might be added here concerning the Aerolite 300 glue and its GBP separate-application hardener. In spite of fears that haste would be required in glueing such large components as the laminated booms, the rush to clamp up the first boom proved quite unnecessary, once an orderly system had been evolved. Strength tests on specimen glued joints have been carried out at regular intervals with completely satisfactory results. The green-coloured hardener, though offensive to the eye, particularly at splices in ply, or where it has been allowed to run down a job, has been found to be greatly preferable to its colourless equivalent when assessing the efficacy of a glued joint, as it imparts a visible greenish tinge to any surplus glue.

The wing ribs all have the same external profile and are therefore being built in the same jig (Fig. 3). The only variations are in the internal details, which are located by easily removable steel pins. Adhesion of ribs to the jig is prevented by rubbing with a block of beeswax the parts of the jig which are likely to come into contact with glue. This practice in no way causes the parts of the rib to become greasy, which would impair the strength of the glued joints. While the rib framework is still in the jig, the 1mm ply bands (visible in the photograph) are glued in place, pressure being applied by superimposing flat boards held down with weights.

Turning to the tail unit, neither the fin and rudder nor the tailplane and elevator have given rise to snags worthy of mention. The former pair is now complete; and all components have been built for the horizontal surfaces and are now awaiting assembly.

The metal fittings used in the construction of the Turbi are on the whole so simple that only time and very basic tools are required, and most of the fittings have been made. Welding has been done professionally in accordance with P.F.A. requirements.

One respect in which the procedure for making metal parts has differed from the woodwork side is that new drawings have had to be produced for most fittings, to cater for differences between British and French standards (such as gauge, bolt and tube sizes). In the case of the undercarriage, this has necessitated what amounts to the complete re-design of this unit. Not only are the sizes of the tubes and wheel-hubs different, but it has also been considered wise to improve on certain aspects of the original design which have proved troublesome in service on the French prototype aircraft. These include weakness in the welding near the axle and insufficient damping of the coil-spring shock-absorber strut. In the latter case it is proposed to use rubber in place of the spring.

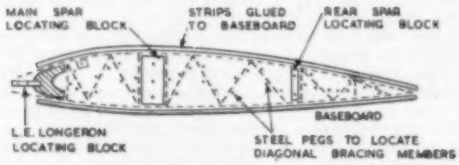

MAIN SPAR LOCATING BLOCK
STRIPS GLUED TO BASEBOARD
REAR SPAR LOCATING BLOCK
BASEBOARD
L.E. LONGERON LOCATING BLOCK
STEEL PEGS TO LOCATE DIAGONAL BRACING MEMBERS

Fig. 3. Wing-rib jig. Rib components are shown dotted or shaded.

The only remaining major modification has been to re-design the engine bearers to take the Walter Mikron II engine. It is expected that, on approval from P.F.A., drawings of all these modifications will be made available by them to other Turbi constructors, who may not yet have reached the stage when they have had to grapple with these problems themselves.

T. J. R. L.

AVIATION OLYMPICS?

AN international aviation sports meeting, to be held in a different country every four years on the lines of the Olympic Games, is being planned by the Fédération Aéronautique Internationale. It would include powered-aircraft flying, gliding, ballooning, parachuting and model flying. A permanent committee has been appointed to prepare a programme and lay down rules.

It has been suggested that the meeting should include the international aerobatic competition, but the Lockheed Hydraulic Brake Co., who give the prizes for the existing event (entries for which were announced in *Flight* last week) have so far stipulated that this contest be held in Britain.

THE GERMAN PIAGGIOS

THE version of the Piaggio P.149 ordered for the German air force as a trainer and communications aircraft is an adaptation of the standard touring and club aircraft. The P.148 was the side-by-side two-seat military trainer, with a fixed-tailwheel undercarriage, which is now the principal Italian Air Force basic trainer for the selection stage. The first prototype flew on February 12, 1951; the type had been ordered in June 1950 and deliveries started two years later, in June 1952.

The P.149, a four/five-seat touring machine, with retractable nosewheel undercarriage, constant-speed airscrew and Lycoming engine, first flew on June 19, 1953. During the following two years the first two prototypes were demonstrated at various air shows and rallies; and last summer one was shown at the comparable trials for trainers held for the Luftwaffe at Norvenich. German reactions were so favourable that Piaggio began straight away to construct a modified version in which the P.149's Lycoming GO-435 of 260 h.p. was replaced by the larger GO-480 giving 280 h.p. The number of seats was reduced to two, the controls were altered to conform to military standards, and special seat harness and provision for parachutes were added.

One month after the decision was taken to produce the modified version, the first P.149D was flying; and last December the Germans were able to evaluate it at Hangelar airfield, near Bonn. The result was a firm order for 75 aircraft to be produced by Piaggio, fitted with the Piaggio type 1033 constant-speed, three-blade airscrew, and with the Lycoming engines which they were building under licence as well. Meanwhile the German Focke-Wulf company of Bremen took the licence for construction of the P.149D, and some 500 were ordered.

Principal data of the P.149D are: span, 36ft 5in; length, 28ft 1in; height, 9ft 6in; wing area, 202.5 sq ft; empty weight, 2,500 lb; maximum aerobatic weight, 3,190 lb; maximum total weight, 3,700 lb; maximum cruising speed, 168 m.p.h.; range, 610 miles; full-load ceiling, 17,050ft; full-load take-off over 50ft, 1,280ft.

"BALE OUT AND SURVIVE"

Duties of a Fleet Air Arm Special School

By A. CECIL HAMPSHIRE

THE cost of training a Fleet Air Arm pilot is between £30,000 and £40,000. Not unnaturally the Navy attaches considerable importance to the means of his preservation should he be compelled to bale out, force-land or ditch. Naval aircrew safety equipment is therefore planned to cover a wide margin of emergencies. In addition, aircrew are taught how to improvise the various items of equipment to aid survival.

The trials and development of all such equipment, instruction in methods of survival, and the training of officers and ratings in safety equipment duties form the main tasks of the Fleet Air Arm Safety Equipment and Survival Training School.

Originally started at Eastleigh in 1943, it is now at Seafield Park, close to the R.N. Air Station, Lee-on-Solent. Once a Georgian mansion standing in extensive grounds, then a preparatory school, and finally, except for the servants' quarters, a charred ruin as the result of two disastrous fires, Seafield Park was taken over by the Admiralty after the war. Attractively set amid the trees, lawns and flowering shrubs of the mansion grounds, the one-time servants' block has been converted into the school's wardroom mess, and a number of single-storey buildings have been erected to house offices, lecture rooms and store rooms. The Solent is within easy reach for various training phases which require to be carried out under realistic conditions. Also at Seafield Park and working in close collaboration with the Survival School is the R.N. Air Medical School, whose primary function is the training of air medical officers.

There are two types of course for F.A.A. safety equipment officers: the basic course lasting two weeks for squadron S.E.O.s, and a six-week course for station S.E.S.O.s. The courses cover practical experience of the inspection and packing of parachutes, abandon-aircraft drills, parachute jumping technique, life-saving waistcoats, dinghy packs (to include dry and wet dinghy drill), emergency packs, repairs, ejection seat, flying clothing and wet winching, concluding with half a day at the air medical school. The station S.E.S.O. course also includes a visit to a firm manufacturing safety equipment.

Training for ratings is considerably more detailed, since safety equipment handling is a Fleet Air Arm specialist subject in the same way as gunnery or torpedo/anti-submarine in the seaman branch of the general Service. There are three classes of safety equipment rating, the first-class rate usually being held by chief and petty officers, who themselves become instructors.

The qualifying course for the third-class rate lasts 12 weeks. Its syllabus covers the packing and fitting of all types of parachute in naval use, including packing without proper tools and facilities; servicing, storage and transportation, and safety harness; dinghies and associated equipment, their inflation, deflation, folding and stowage; search and rescue apparatus; helicopter rescue harness and strop; flying clothing, which includes underwear, overalls, helmets, goggles, anti-g suits, immersion suits, inflatable exposure suits, aircrew life-jackets and oxygen equipment; ejection seats and emergency equipment.

Advanced courses for higher S.E. ratings, all of which are conducted at Seafield Park, include lectures on the fabric and repair of parachutes, with recourse to sewing machines—hand, treadle and electrically driven; synthetic and live parachute jumping; wet and dry dinghy drill; servicing and repair of rescue apparatus, flying clothing and survival equipment; servicing and repair of oxygen equipment; air medicine, with an anoxia run in the decompression chamber; and ejection seat training. For S.E.1 rating the wet dinghy drill is carried out in the Solent with helicopter rescue, serving the dual purpose of training rescuer and rescued in appropriate techniques.

Senior courses last nine weeks, and include swimming, daily exercises and organized games. Physical training is important since it raises morale by improving the standard of mental and physical alertness, and demonstrates the close relationship of physical fitness to parachute jumping, abandon-aircraft and wet dinghy drill training.

F.A.A. safety equipment personnel are usually allocated in the ratio of one officer and two ratings to each squadron, and one officer and from four to eight ratings to a Naval air station.

Seafield Park's instructional facilities include parachute packing rooms, and an ejection seat room with a fully rigged seat for theoretical instruction. Practical ejection seat training is done on a "vertical runway" fitted to a tower in the grounds.

The dinghy room is equipped with a set of dropping gear, as well as dinghies, dinghy packs and dummy containers for packing training. The naval dinghy pack normally holds, in addition to the dinghy, compressed air bottles, distress cartridges, matches, de-salting kit, rations, first-aid kit, leak stoppers, wrist-fitting paddles, and an instruction booklet.

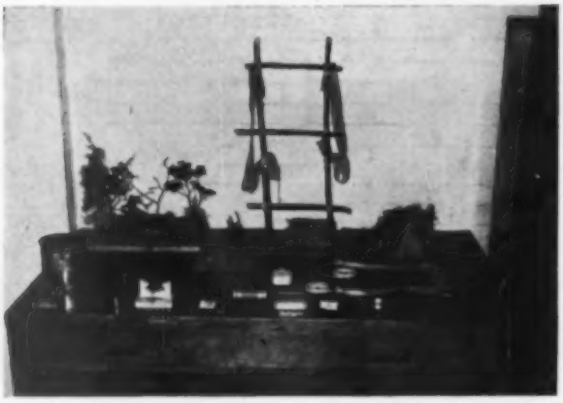
The dinghy itself contains a baler and baling sponge, heliograph, inflating bellows pump and inflatable exposure suit. Additional items which can be included in the pack are a mosquito net, gloves, socks, a drogue, knife, compass, a tin of fishing kit, needles and thread, and ground/air emergency code. There is also a waterproof poncho, drab coloured on one side and mauve or yellow on the other so that it can be used as a means of identification from the air. The dinghy pack itself can be made into a march haversack, using the parachute straps for slings. The poncho can also be utilized in a number of ingenious ways, from tent to portable water bag.

Theoretical ditching instruction is first given in a class-room with a mock-up cockpit. Subsequently the cockpit is taken to a swimming bath, where the pupil, strapped in and wearing full flying kit, is swung into the water from the high diving board. Under the critical eyes of instructors he must extricate himself,

(Left) Synthetic parachute-jumping training. (Right) Safety-equipment ratings under training receiving instruction on the M-type dinghy. The instructor is holding the small drogue, or sea anchor, which prevents the dinghy drifting away down wind after inflation.

"BALE OUT AND SURVIVE . . ."

A survival course at Seafield Park about to set off for "the long walk." (Below) Improvised items of survival kit and models of shelters. At back, haversack carrier contrived from sticks and parachute straps. On left, cookers improvised from tins.



inflate and board his dinghy just as he would in the event of a real ditching.

An important item of survival equipment shortly coming into use for Naval aircrew is a V.H.F. homing device known as TALBE (Talk and Listen Beacon Equipment). Worn round the waist while flying, the battery-operated TALBE gives six hours' continuous signal use, longer if operated intermittently, with an air range of about 75 miles and a surface range of some 12 miles.

Most F.A.A. aircrew undergo a two-week survival course at Seafield Park. The first week is devoted to films, lectures and talks by experts covering Arctic, desert, and jungle survival, living as a castaway, trapping, rock climbing, travel camouflage, escape and evasion, maps and compasses, pack and shelter making, and elementary first aid. With this instruction goes daily physical training. With the aid of models pupils are taught various tricks of survival, which range from building a rain-proof shelter to the improvisation of an effective cooker from an old tin. On one wall of this instruction room hangs the brief but pointed slogan "Think or Die."

In the second week the pupils put their tuition to practical use, and this field work includes what is called "the long walk." Clad in the garb they would be wearing after baling out or forced landing during operations, the "downed airmen" are turned loose in the middle of the New Forest to make their way by day and night marches to a specified point some 60 miles distant.

Their sole food for the journey consists of an uncooked pigeon, a piece of raw steak, four potatoes and some onions. The only cooking facility is an empty jam tin. Each man must fend for himself, and is forbidden to augment his rations except by what he can forage legitimately from natural sources. Rendezvous points must be reached at set intervals during the trek.

The normal naval immersion suit worn by aircrew on operations has special rubber boots fitted as an integral part of the garment, but for the purpose of the "long walk" leather marching boots are issued. One Australian undergoing the course found that the boots made walking painful and discarded them in favour of rubber gym shoes. These soon gave out, however, and when he limped to the rendezvous lorry he was delighted to find the crew had rescued his jettisoned footgear. But to his disgust he was reminded that in a real life walk he would get no second chance, and he had to finish the march with his feet in such wrappings as he could contrive.

Seafield Park's survival instructional staff, including the commanding officer, are all experts at their job, and themselves periodically take part in trials of new methods of escape, evasion and survival.

As well as giving training in aviation medicine, the adjacent air medical school investigates the physiological and psychological aspects of safety equipment and survival. The school has two decompression chambers for pilots' high altitude indoctrination. Heights up to 70,000ft can be simulated, with explosive decompression. Under construction is a special Arctic tank which will be filled with seawater chilled to 32 deg F, and used for testing dinghies and survival clothing.

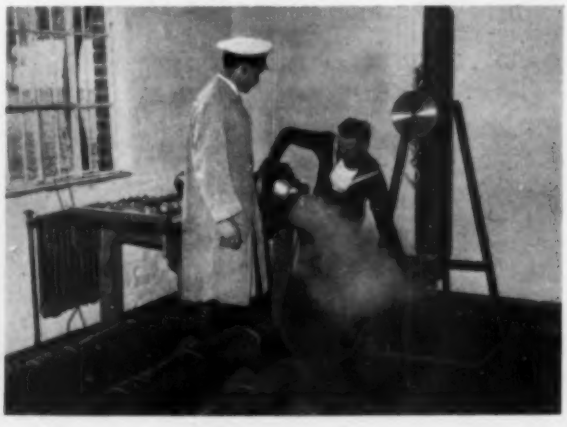
All medical officers in the Fleet Air Arm receive jet flying experience, with ejection seat training and wet winching to give them a thorough understanding of pilots' problems. The school is probably unique in boasting its own Link Trainer for the use of medical officers under instruction.

As well as investigating naval air accidents and analysing the reasons for survival or non-survival, Seafield Park is also responsible for the trials and development of such specialized flying kit as the "bone dome"—a Navy brainchild; the immersion suit—which developed from experience gained during the war with C.A.M.* ships, whose pilots had to ditch; exposure suit; altitude suit and anti-g suit; and parachutes and dinghies. Still under test is the solar still, a two-foot plastic sphere for distilling salt water by the heat of the sun. This will eventually replace the de-salting kit in the survival pack. Both the still and research on dinghies have equal application to the Merchant Navy.

At present Seafield Park boasts neither crest nor motto; if and when it does the motto might well be "Bale out and Survive!"

**Catapult aircraft merchantmen.*

Safety-equipment rating under training about to insert the auxiliary parachute into a pack. (Right) Charging a CO_2 cylinder.



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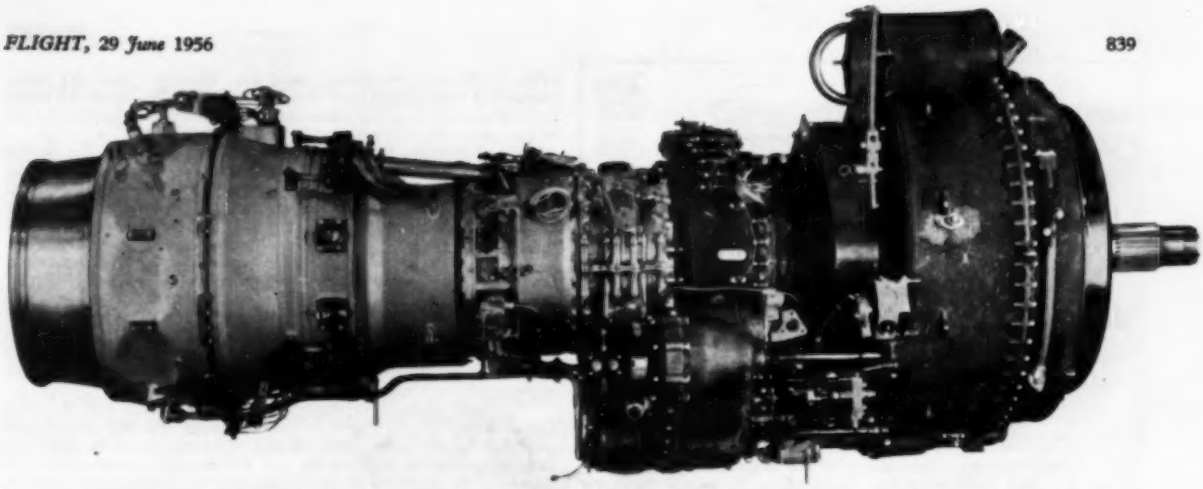


ROLLS-ROYCE TURBOPROPS

An Account of the First Decade of Development

IN a paper read recently before the Canadian Aeronautical Institute, Mr. D. P. Huddie, chief development engineer (civil engines) of Rolls-Royce, Ltd., outlined the whole programme of Rolls-Royce turboprop development for aircraft propulsion. It was a notably informative account of what is certainly the "most experienced" commercial-turboprop development programme in the world.

In 1943, said the lecturer, the company decided to convert a Derwent turbojet to drive an airscrew by fitting a suitable turbine and reduction gear. The resulting engine was known as the Trent and two were fitted to a Meteor which began flight trials in 1945. The main purpose of the exercise was to obtain practical experience of turboprop control problems at reasonable forward speeds, and especially to investigate control-system requirements for take-off, approach, and baulked landings. Trent flying amounted to 300 hr and provided a valuable basis upon which the control system of the Dart was founded.

In 1943 Rolls-Royce also began the design of an ambitious axial-centrifugal, two-shaft engine which became the R.B.39 Clyde. The mass flow was 41.5 lb/sec and the pressure ratio 6:1, providing approximately 4,000 h.p. with a specific consumption of 0.71 lb/hr/e.h.p. The Clyde did about 3,300 bench and flight hours but, said Mr. Huddie, "was dropped in 1949 owing to lack of a suitable aircraft."

Concurrently with the Clyde, work started on a smaller turboprop designed to give 1,000 h.p. This engine, which was named Dart, was projected to make the maximum use of existing experience and the original form of compressor was a two-stage centrifugal unit almost identical with the supercharger of the Eagle piston engine, the pressure ratio being 6:1. The prototype first ran in July 1946 and completed its first type-test at 1,000 h.p. in December 1948.

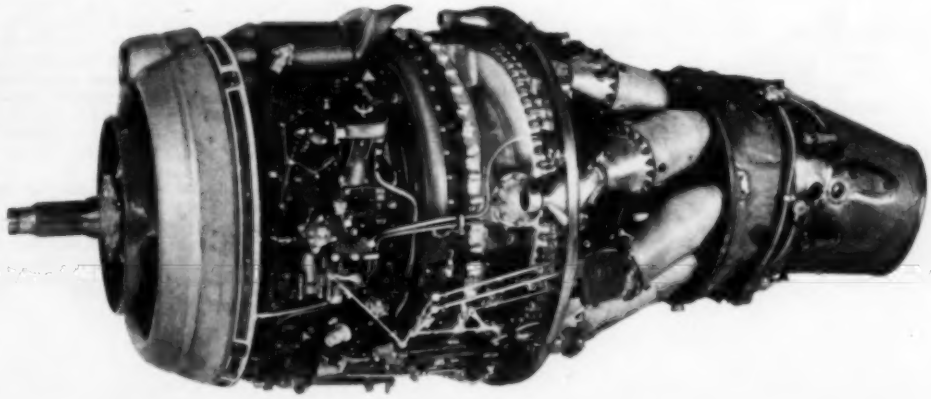
Steady growth of the Viscount airframe resulted in redesign of the Dart, which reached 1,400 s.h.p. for take-off at the time of the official production type-test in March 1951. The first production engine was delivered in June the following year and scheduled service with B.E.A. started in April 1953, after a total of 27,630 hr (including 13,100 in flight).

The build-up of development and the corresponding cost is shown in two accompanying figures. The cost includes the manufacture of all development engines and all bench and flight testing carried out by Rolls-Royce, together with normal factory overheads, but does not include the flight testing of the prototype Viscounts. The Dart was installed in the nose of a Lancaster which was fitted with a water-spray grid for icing trials. The Lancaster was also used to measure in-flight engine speeds and drags following failures of the control system. Dart engines equipped to form what were virtually complete Viscount powerplants were also fitted to three DC-3 aircraft, one of which was used by Rolls-Royce and the other two by B.E.A. on freight services. The two latter aircraft accumulated 3,870 engine flight hours and were extremely useful in early fault-finding, in proving increased overhaul life to the satisfaction of the certifying authorities, and in giving B.E.A. experience on the Dart.

This method of engine development had proved very satisfactory and Rolls-Royce proposed to repeat the same exercise on the new R.B. 109 Tyne engine. A four-engined Lincoln would be used as the special flight-test vehicle with a Tyne mounted in the nose, and twin-engined Ambassadors would be employed for normal flight testing and preliminary endurance flying.

Various design studies had culminated in the Tyne as an engine suitable for future transport aircraft. The new engine was a twin-shaft axial of 4,000 s.h.p. with a pressure ratio of 13:1 [these are original design figures—Ed.]. The Tyne first ran in April 1955 and had already completed a 150-hr test to type-test schedule at the design flame-temperature. The high-pressure compressor and turbine were an actual scale of the corresponding components on the Conway by-pass engine; the low-pressure compressor was also a scale (at a different ratio) of the Conway low-pressure compressor, and the three-stage low-pressure turbine was based on the similar three-stage turbine used on the later Darts. The Tyne was also fitted with cooled turbine blades. Turbine-blade cooling was just about to be incorporated in production Avons for military use and had been fitted to all Conways; at the time of preparing the lecture, Rolls-Royce had completed a total of 5,200 engine hours on air-cooled turbine blades.

The next major section of Mr. Huddie's paper discussed the remarkable improvements in performance which had been



A decade of advance in turboprop technology is manifest in the photographs on this page. Here is the Dart 510, now being mass-produced for Viscounts and backed by well over a million airline hours. At the head of the page is the newer and very efficient Tyne, shown to approximately the same scale.

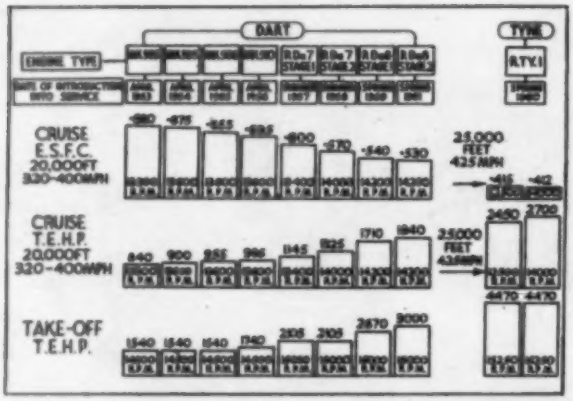


Fig. 1. Diagrammatic representation of the performance development of the Dart and Tyne turboprops. Values shown for engines up to the RDa. 7 are measured; the RDa.8 figures are based on past rig testing.

ROLLS-ROYCE TURBOPROPS . . .

achieved with the Dart. This was shown in Fig. 1, the performance up to and including the RDa.7 (Dart 520) being established by full engine running and the RDa.8 being based on rig testing already completed. The next diagram (Fig. 2) showed the means by which three selected stages in Dart development had been brought about. It was emphasized that the development had been achieved with no increase in outside diameter and only very slight increase in length to accommodate an additional turbine stage (to a total of three) and a strengthened reduction gear necessary for the increased power.

The lecturer then reiterated points contained in a paper last year by his colleague Mr. A. A. Lombard: unlike the turbojet the turboprop continues to improve in efficiency with increase in turbine-inlet temperature as well as with increase in pressure ratio. "We are confident," said Mr. Huddie, "that the basic twin-shaft axial-compressor formula with air cooling of the early turbine stages is for this reason an engine which is capable of a lot of performance development."

As a company, Rolls-Royce were convinced that the useful upper limit of cruising speed with turboprops would be about 450 m.p.h. The economic case for the turboprop for short and medium ranges at this speed rested solely on the inherently greater flexibility of the engine which was brought out in protracted stacking or in cruising at other than optimum altitude.

All Darts were equipped with water-methanol injection so that the engine could deliver I.S.A. power up to I.S.A. + 30 deg C. A similar system would be available, if required, on the Tyne. In the last stages in Dart development (RDa.8) the cruise power was so great that the take-off power was much better than the Viscount could comfortably utilize. It could be seen from Fig. 3 that, for normal use, there was not likely to be any necessity for water-methanol injection on this engine.

The next major topic discussed by Mr. Huddie was the control system. From Fig. 4 it could be seen that the engine and airscrew levers were mechanically interconnected to give the desired relationship of r.p.m. and turbine-inlet temperature (or power). In order to maintain the desired relationship over the whole range of ambient air temperature and aircraft speed it was necessary to vary the geometry of the interconnection. This was achieved through manual control of an electric fuel-trimming actuator so that the engine could be run at the maximum permitted turbine-level temperature and thus give optimum s.f.c. Considerable development work had also been completed on automatic systems.

The basic interconnection curve of the Dart 510 was shown in Fig. 5. At the minimum control r.p.m. of the airscrew control unit, the fuel flow could be progressively reduced without further reduction of speed. On a fixed-shaft engine like the Dart the maintenance of relatively high r.p.m. with low fuel flow made it possible for the airscrew to offer considerable drag upon landing

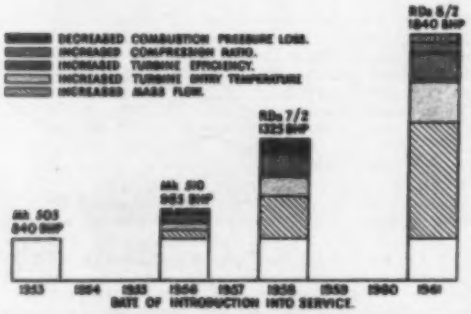


Fig. 2. Some of the methods whereby spectacular increases in Dart performance have been obtained. The powers shown are cruising settings at an altitude of 20,000ft.

Fig. 3. The development RDa.8 will give the Viscount substantial reserve power and water/methanol will not be required anywhere within the shaded area, i.e. no airline is likely to require it at all.

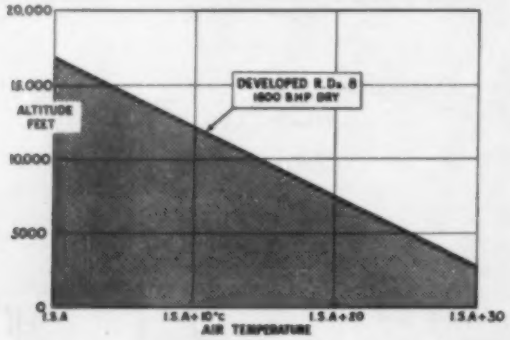
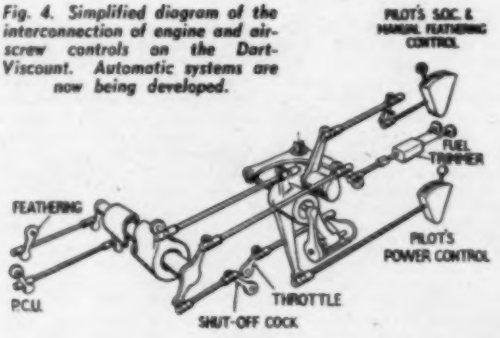


Fig. 4. Simplified diagram of the interconnection of engine and airscrew controls on the Dart-Viscount. Automatic systems are now being developed.



without going into reverse pitch (Fig. 6). During the normal approach the blades were held on the flight fine-pitch stop of 21 deg, until the stops were withdrawn upon deflection of the main oleos allowing the blades to fine-off to 4 deg. Even at 21 deg there was no drag available during the descent.

On the later Tyne the same basic interconnection system was incorporated to provide airscrew drag on the approach. After touchdown, however, the drag available at the ground fine-pitch stop would not be very great, since the airscrew would be driving only the low-pressure shaft system. For the Tyne it would therefore be necessary to develop a fully reversing airscrew. It was an advantage to maintain relatively high airscrew r.p.m. on the approach to ensure rapid acceleration to full thrust in the case of a baulked landing. This meant relatively high shaft speed in the low-pressure system, and this had been provisionally set at 11,500 r.p.m. (75 per cent of take-off r.p.m.). It was also necessary to minimize the fuel flow during the approach to give the required drag conditions. The resulting combination of high low-pressure r.p.m. and low high-pressure r.p.m. was obviously one in which the low-pressure compressor would tend to surge. The two compressor spools were therefore joined by a bleed valve which was controlled automatically by corrected r.p.m. signals from the two shafts to give the desired engine conditions. All Rolls-Royce turboprops were fitted with automatic pitch coarsening.

Engine r.p.m. and airscrew drag for the latest production Dart in the Viscount were plotted in Fig. 7. It had been demonstrated that the engine could, without failure, stand the maximum r.p.m. that would be achieved and that the aircraft could accept the maximum drag. The next diagram showed corresponding values for the Tyne; in this case the airscrew was driving only

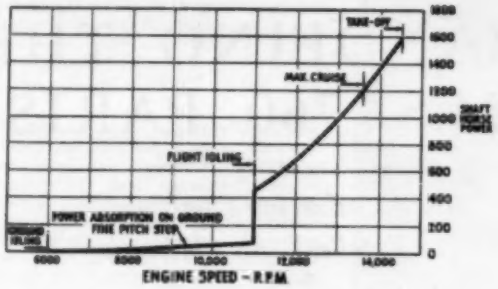


Fig. 5. The basic interconnection of the Dart 510. An important point is the provision for high r.p.m. with low fuel-flow, as discussed in detail in the text.

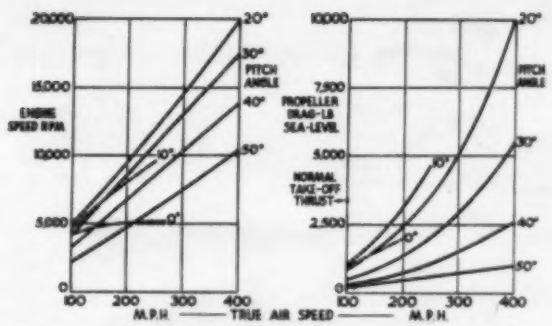


Fig. 7. Plots of engine speed and airscrew drag for the Dart 510.

the low-pressure shaft system, so that at the same pitch angle much higher r.p.m. would be reached. Special precautions were therefore necessary to limit the rotational speed. The speeds and drags for failure cases could be confirmed by the use of a four-engined flight-test vehicle (such as the Tyne-Lincoln) and a special motoring test-bed was also used, to enable actual measurements of windmilling powers and speeds to be made.

Turning to the aspect of serviceability, Mr. Huddie produced Fig. 9, showing that, on Darts, the average unscheduled engine removal rate last year was 0.182 per 1,000 hr. The two peaks in the curve (along the foot of Fig. 9) were due to different reasons. The first rose from troubles—mostly minor—which had never been found in development. The second peak was due to trouble associated with relatively long life. Both peaks contained a number of removals which subsequent experience showed to have been unnecessary.

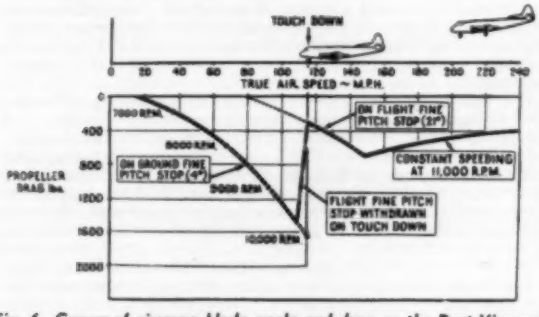

TOUCH DOWN
TRUE AIR SPEED — M.P.H.
PROPELLER DRAG lbs.
ON FLIGHT FINE PITCH STOP (32°)
ON GROUND FINE PITCH STOP (4°)
CONSTANT SPEEDING AT 11,000 R.P.M.
FLIGHT FINE PITCH STOP WITHDRAWN ON TOUCH DOWN

Fig. 6. Curves of airscrew blade-angle and drag on the Dart-Viscount during a normal landing.

Service experience of the Dart had produced fatigue failures both of high-pressure turbine and of the first-stage compressor rotor, and both failures were subsequently established as arising from resonance at a particular engine speed in the taxying range. Such failures had never occurred in development, although some of the components that failed had been tested to well beyond the hours at which the failure occurred. Inevitably a high proportion of development endurance-running was done to the official schedule, and one of the merits claimed for the British type-test schedule was its thorough examination of the speed range between maximum-continuous and flight-idling. There had not been one fatigue failure in the Dart which had not been identified and cured; nevertheless, the fact that the two types of failure which had occurred in service were due to resonance between ground- and flight-idling seemed to indicate that the type-test schedule should be expanded to search the complete speed range right down to the ground-idling limit. Rolls-Royce were currently performing trial tests with a tentative schedule designed to meet this requirement.

As an example of mechanical development, Mr. Huddie then discussed the development of the Dart flame tube. Originally these components became severely buckled after 750 hours of peak skin temperatures exceeding 1,020 deg C. Acting on a suggestion of Dr. J. S. Clarke of Joseph Lucas (G.T.E.), Ltd., a revised design of skin-cooled flame tube had since been standardized (this development was extensively reported in our issue dated January 14, 1955; present Darts use a slightly different form of flame tube from that shown in this article—Ed.). The lecturer showed a set of tubes after more than 1,230 hr service life to be in perfect condition; these tubes were returned to service for a full 500 hr and it was fairly certain that the new tube would be good for between 1,500 and 2,000 hr without attention.

The final section of Mr. Huddie's paper was concerned with noise. Some years ago, he said, Rolls-Royce and Vickers-Armstrongs collaborated in an evaluation of the noise-producing factors of the Viscount. It was found that the airscrew disc loading had only a small effect on the noise and that by far the greatest effect was the true helical Mach number of the blade tips. From one set of results, in the plane of the inboard airscrews at 20,000ft altitude, it was possible to show that the noise energy, in the frequency band of 75 to 300 c.p.s., varied approximately as the tenth power of the helical tip Mach number. It had therefore been decided that in the Vanguard the cruise helical tip Mach number would have to be restricted to 0.85; there was an incentive to provide the greatest possible difference between take-off and cruise r.p.m. and then select the optimum gear ratio to satisfy the conflicting requirements of high thrust at take-off and low noise in cruising flight.

Fig. 8. Curves of engine speed (low-pressure spool) and airscrew drag for the Rolls-Royce Tyne.

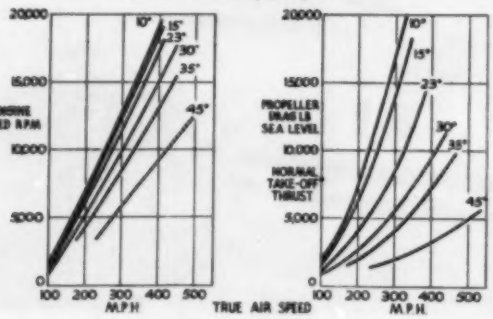
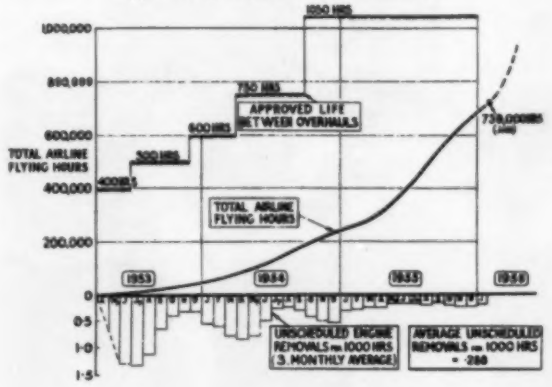


Fig. 9. Curves of Dart hours, overhaul life and unscheduled removals up to the beginning of this year. Total airline hours are now approaching one-and-a-half million.



HANDLING THE M.S. 760 PARIS

An "Executive Jet" with Excellent Air Manners

By C. M. LAMBERT

EVERY now and then one finds a real peach of an aircraft—one which performs and behaves in relation to its intended rôle exactly as it ought to. My most recent delight was the Morane Saulnier M.S. 760 Paris, which I flew in France soon after it had returned from its North American sales tour for Beechcraft. The aircraft still carried its splendid white, blue and red trim, and on its nose was a map of the U.S.A., showing the route it had followed on its tour.

From outside the Paris looks well, but inside it looks better still. The predominant cabin colour is pale grey, with occasional red piping. Panels and consoles are all grey and instruments are black with white lettering. Everything stands out clearly and is easily recognized by distinctive shaping and marking.

The four seats naturally take up almost all the available space in the cabin and getting in without dirtying them with the feet would be tricky if it were not for the fact that the central arm-rest in the front bench can be swung up and forward to expose a long, flat, metal-faced footstep. A short ladder can be attached to either flank of the fuselage to take the passenger up two or three feet to cabin sill level. Once installed, the view is excellent in all directions, particularly over the nose, and the seats are very comfortable.

The sliding plastic canopy is large and can make the cabin very hot in bright sunshine, so adjustable purple plastic visors are fitted in the windscreen bridge for the front seats, together with four fully adjustable cloth concertina blinds in the roof. So shade is not hard to come by; and the addition of a full-scale air-conditioning system makes life very pleasant. The Paris is, of course, also fully pressurized. The canopy is opened or closed by an electric motor and the pressurization seal is separately inflated by moving a manual control on the right windscreen sill. The conditioned air, derived from compressor bleeds on the two Turboméca Marboré II engines, is passed through expansion turbine and heat-exchanger, and cabin temperature can be fully adjusted.

All the flying controls are now of the plain mechanical type, since the spring tabs on the ailerons have been locked. But it is possible that these tabs will again be brought into use, even though lateral manœuvrability is of a very high order without them. The wheel-brakes are hydraulic, operated by tilting the harmonium-type rudder pedals forward, but all other services are electric. Flaps and undercarriage are controlled by switches with heads shaped like a flap or a wheel; indicators are needle and three-light respectively. The air-brakes, which emerge from the upper and lower surfaces of the inner wing, are operated through a switch sliding fore-and-aft inside the head of each right engine power lever. In similarly modern manner, the elevator and aileron trim are adjusted by moving a button on top of the control column in the direction of the required trim alteration. The power levers (one set for each pilot) are paired, like those of the R.A.F.'s Meteor, to form a single continuous grip that can be comfortably held in one hand.

The instrument panel is excellent in its simplicity. The six blind-flying instruments are arranged to port in the standard R.A.F. layout and include a G.4 gyro-magnetic compass, needle-and-ball turn indicator, V.S.I. in hectometres/minute, and altimeter in metres, with a needle indicating hundreds and a veeder-type window showing thousands. A.D.F. dial, clock, Mach- and g-meters, flap- and trim-position gauge and miniaturized undercarriage warning lights complete the main instruments in front of the first pilot.

Engine instruments are on a small panel above the central control pedestal and include twin r.p.m., jet-pipe temperature and

The instrument array, with radio and circuit-breaker panels on the right. The central arm-rest hinges forward to reveal a foot-plate that assists access to the front seats. (Right) The sliding canopy, and the small ladder provided to facilitate getting in and out.

Elegance both in form and finish distinguishes the Morane Saulnier Paris—an aircraft that "looks right" from any angle. On the opposite page is a close-up of the distinctive tail unit and the starboard jet-pipe exit.

oil pressure gauges, together with fuel contents and fuel flow gauges. In front of the co-pilot are the radios and circuit-breaker panel. Since the aircraft services are all-electric there are many breakers, but they have been arranged in marked groups for easy identification. Stand-by controls for air-brakes, flap and undercarriage are mechanical. Rudder pedals are individually adjustable and the control-column grip is of the plain stick type.

Jean Cliquet, the Paris test pilot who took me up, started the engines with the aid of an external battery and activated all the necessary circuits for instrumentation and radio. He taxied out using the steerable nosewheel, setting a spanking pace down the long, straight Villacoublay taxi-way. There was, of course, no need to run-up the engines and, after turning on to the runway, setting trims and checking switches, we were smartly away. The take-off took 20 sec, the Paris unsticking at 92 kt with four people up; and by the time we reached the end of the 2,000 yd runway we were making 150 kt.

Cliquet held the aircraft level for a while until we reached 215 kt, when he settled into a 1,640 ft/min climb at climbing power. On the way up we engaged hood-seal inflation and selected air-conditioning with a pleasant flow of cool air. Though the pressurized atmosphere produced in the cabin is never quite the same as plain untreated air, it is pleasant to be able to regulate the temperature to be just right.

Pretty soon each of the four of us had adjusted his sun-blind to give the degree of shade that he wanted, and Jean Cliquet proceeded to show me how the Paris handled. Lateral control is light and a high rate of roll can be achieved despite the fact that the aileron tabs had been locked in the neutral position. For the pilot-training rôle tabs would probably once again be brought into action though for normal executive flying the available rate of roll without them is almost more than enough.

Cliquet next trimmed "hands off" at 260 kt and 9,500ft altitude. Telling me to watch carefully, he pulled one power lever smartly back to the closed position without touching the stick or rudder bar. Even from the Paris I had not expected anything like what followed. There was a slight twitch towards the throttled engine, but that was all. Neither yaw nor roll developed and the aircraft carried straight on, the nose dropping very gently as the speed came slowly back following the reduction in power.

This was just a foretaste of the handling characteristics. For a demonstration stall the power levers were pulled back and the speed fell off very slowly. After a long wait we reached 92 kt and, with the nose held up at about 15 deg, rough airframe buffeting developed into a straight stall. With the stick held well back neither nose nor wing dropped and the Paris continued to lose height in that attitude until Cliquet let go of the stick. The aircraft then dropped its nose and recovered straight ahead all by itself.

In case I was not sufficiently impressed with this exceedingly gentlemanly behaviour, Cliquet then showed me another of the M.S. 760's delightful habits. He put it into a 20 deg dive at 350 kt and trimmed it "hands off." In this condition he extended the airbrakes and sat back again. Deceleration was decisive but not rough and, with the controls still free and the g-meter registering one extra g, we came gradually out into a 10 deg climb at 220 kt. The airbrakes are set to give this gentle but decisive dive recovery.

There was now not much more time to spare, so Cliquet handed over control to me. I soon began to enjoy that balance of steadiness and responsiveness which is the hallmark of a well-harmonized control system. I turned and dived and zoomed happily for several minutes and then asked somewhat hesitantly whether, with four people up, it would be in order to try a roll (as a two-seat trainer the Paris is, of course, fully aerobatic and spinworthy, but I wasn't sure about such things with four occupants). Cliquet just gestured briefly and, enjoining everyone to tighten his harness, I rolled it as cautiously as if I was turning over a crate of eggs. I need not have worried; the aircraft behaved perfectly, showing no unnatural tendency to fall out of the roll or do anything strange. I rolled again several times, taking care, for the passengers' sake, to apply the minimum of negative g, and felt rather pleased at performing at least a minor aerobatic manœuvre in a jet aircraft carrying four people—though not forgetting that "Tex" Johnston had rolled a slightly larger passenger aircraft, the Boeing 707.

It was now high time to get back to Villacoublay. At 230 kt, with airbrakes out, we descended at 4,900 ft/min. A normal circuit was made at 125 kt with wheels and some flap down; and the final approach, with 50 deg of flap, was at 105 kt. We came down quite steeply, rounded out, floated a little and touched down on the main wheels. Straight away Cliquet put the nosewheel down, engaged nosewheel steering, and let the Paris bowl down to the other end of the runway. The brakes, when he finally used them, were very effective and, disengaging the pressurization and hood seal, we rolled back to dispersal.

I still look back on my trip in the Paris as one of the most pleasant I have had in any kind of executive aircraft. From the pilot's point of view the Paris certainly deserves every success it may achieve.

HELICOPTER ASSOCIATION A.G.M.

IN his address at the recent annual general meeting of the Helicopter Association of Great Britain, Dr. G. S. Hislop, the chairman, expressed concern at the slow development of helicopter passenger services in this country. Achievements by British helicopter charter operators had been remarkably successful in regions as far removed as the Antarctic, the Persian Gulf and the north of Scotland. But compared with Europe and the U.S.A. this country was now a long way behind in the development of passenger services. This was all the more disappointing when one recalled that some years ago we were well in the lead, as far as technical knowledge was concerned.

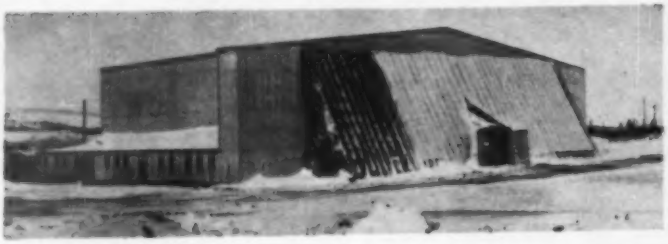
With recent financial cuts applied to the "cinderella" of the aircraft industry, the present helicopter situation did not look very promising and was not helped by the lukewarm attitude prevalent in higher quarters. It was the Helicopter Association's duty never to cease exerting pressure in furtherance of its aims —advancing the science and utilization of rotating wing aircraft.

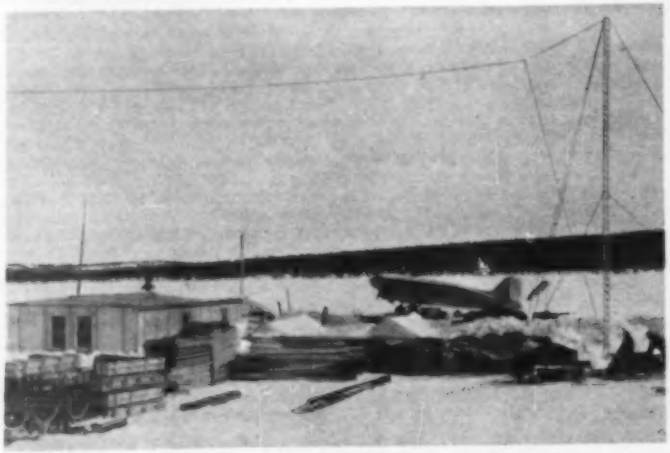
In pursuance of this objective, Dr. Hislop urged the initiation of a more energetic development programme in Great Britain for multi-engined helicopters and also the provision of alternative operating facilities in London when the South Bank site was closed to helicopter traffic. He paid tribute to the work of Lord Douglas of Kirtleside during his term of office as president and welcomed the new president, Lord Brabazon of Tara.

Other business at the meeting included the constitution of the newly elected Council on which there are four new members, Mr. D. L. Hollis Williams, B.Sc., F.R.Ae.S.; Mr. J. E. Harper, A.F.C.; S/L. W. R. Gellatley, A.F.C.; and Mr. A. E. Bristow. The first award of the Alan Marsh Medal had been made to S/L. Gellatley, in recognition of his outstanding work as a helicopter test pilot while at the A. and A.E.E., Boscombe Down.

LOCKHEED OFFER SCHOLARSHIP

AN open scholarship for honours study in mechanical sciences, at Emmanuel College, Cambridge, is being offered by the Lockheed Hydraulic Brake Co., Ltd. It is open to boys from any public or secondary grammar school, of between 17 and 18 years 9 months of age at the time of application. Details are obtainable from the company's education officer, at Tachbrook Road, Leamington Spa, Warwickshire.





ALONG THE FIFTY-FIFTH PARALLEL

PROVIDED by the Canadian Department of National Defence, these newly received pictures show activities connected with the construction of the Mid-Canada Early-Warning Line, which runs along the 55th parallel of latitude. The uppermost picture in the left-hand column shows a mule train, modern style: the diesel-engined tractor seen is one of many types used along the line for hauling construction materials. Below it is depicted a new hangar under construction at Knob Lake, with a temporary tarpaulin cover to retain some measure of heat while work is under way on the interior. Knob Lake is one of the distribution and assembly points for Mid-Canada Line materials, and the hangar is one of a number of installations for the maintenance of the R.C.A.F. aircraft which carry supplies and materials to the outposts. The third picture shows the lakehead site of a central assembly point, with a civilian Dakota freighter. From such sites as these supplies and equipment are hauled to the actual radar-detection sites by helicopter or tractor. At lower left an R.C.A.F. Sikorsky H-34 helicopter reports for duty at a site justifiably described as "in the middle of nowhere"; the second helicopter shown is a Piasecki H-21, and it is lifting a heavy steel tank. Immediately above, three R.C.A.F. Dakotas await their turn for loading at Knob Lake as another of their breed—ski-equipped—takes the air with a load of building materials. Last is a stockpile of materials. The waiting lorries are but one of many means of transportation available to this great and important project, which finds employment for helicopters and dog sleds alike.

Finnair's new Convair CV-440 Metropolitan at Helsinki Airport.

FINLAND'S AIR TRANSPORT

Impressions from a Visit

By PATRICIA AND JOHN STROUD

THE Convair CV-440 Metropolitan was a "mystery" aircraft up to the time of its entry into service with Finnair on April 21. It had been much advertised as a new type, but with a curious lack of detail. We had been assured, by people who should have known better, that it had a greater wing span than the earlier CV-340, that it had a longer fuselage, a new fin, more powerful engines and an improved performance. It was therefore particularly satisfying to be invited by Finnair (Aero O/Y—Finnish Airlines) to fly from London to Helsinki on the first service to be operated from London by the new Metropolitan.

Before departure we had a chance of looking at the Metropolitan, and the only differences we could find were in the exhaust system and the addition of an anti-collision light on top of the fin. The Finnair aircraft bears the registration OH-LRD and it is the first of the company's fleet to carry the new white-topped modified livery with its bold blue and white stripes—the Finnish national colours.

Finnair has a great reputation for punctuality, which is well-deserved, and at the scheduled 1420 hr we taxied away from the apron to take our place in the queue at run-up position. When the brakes were released the CV-440 accelerated smartly, leapt into the air and climbed away steeply in the tradition of its forebears the CV-240 and 340. The airborne time for the first sector to Amsterdam was 1 hr 15 min, giving us time to enjoy lunch and also inspect the cabin.

The Finnair CV-440 has accommodation for 44 passengers so that it can be integrated with the company's fleet of three CV-340s. Metropolitans which have now entered service with S.A.S. have 52 passenger seats. The seats in the Finnish aircraft are all forward facing and arranged in pairs on either side of the wide central aisle; in this connection we must be frank and state that we believe two-and-two seating is far more attractive than three-and-two and that on a route where types of aircraft with both configurations were offered we would choose the former even if the aeroplane itself were older or slower.

The interior decor of Finnair's CV-440 is a break with old tradition and we found it most attractive. The lower walls of the cabin and the seat arms are beige, the carpet is stone coloured and the upper walls, ceiling and baggage racks are white. The front bulkhead is a light brown. The outstanding feature and the most attractive when you first enter the cabin, *via* the front entrance, is the choice of a rich purple for the seats. Alternate light grey and leaf green curtains complete the extremely attractive cabin.

The dimensions of the CV-440 and CV-340 are identical, as are the engines. The main differences between them are those concerned with the sound level in the passenger cabin. Pleasant as the CV-340 is to fly in, passengers have complained of the noise in the cabin and these complaints, intensified presumably by the quietness of the competitive Viscount, have been serious enough to make Convair take action. The problem was tackled in two ways, by modifying the exhaust system and by adding 400 lb of soundproofing to the cabin.

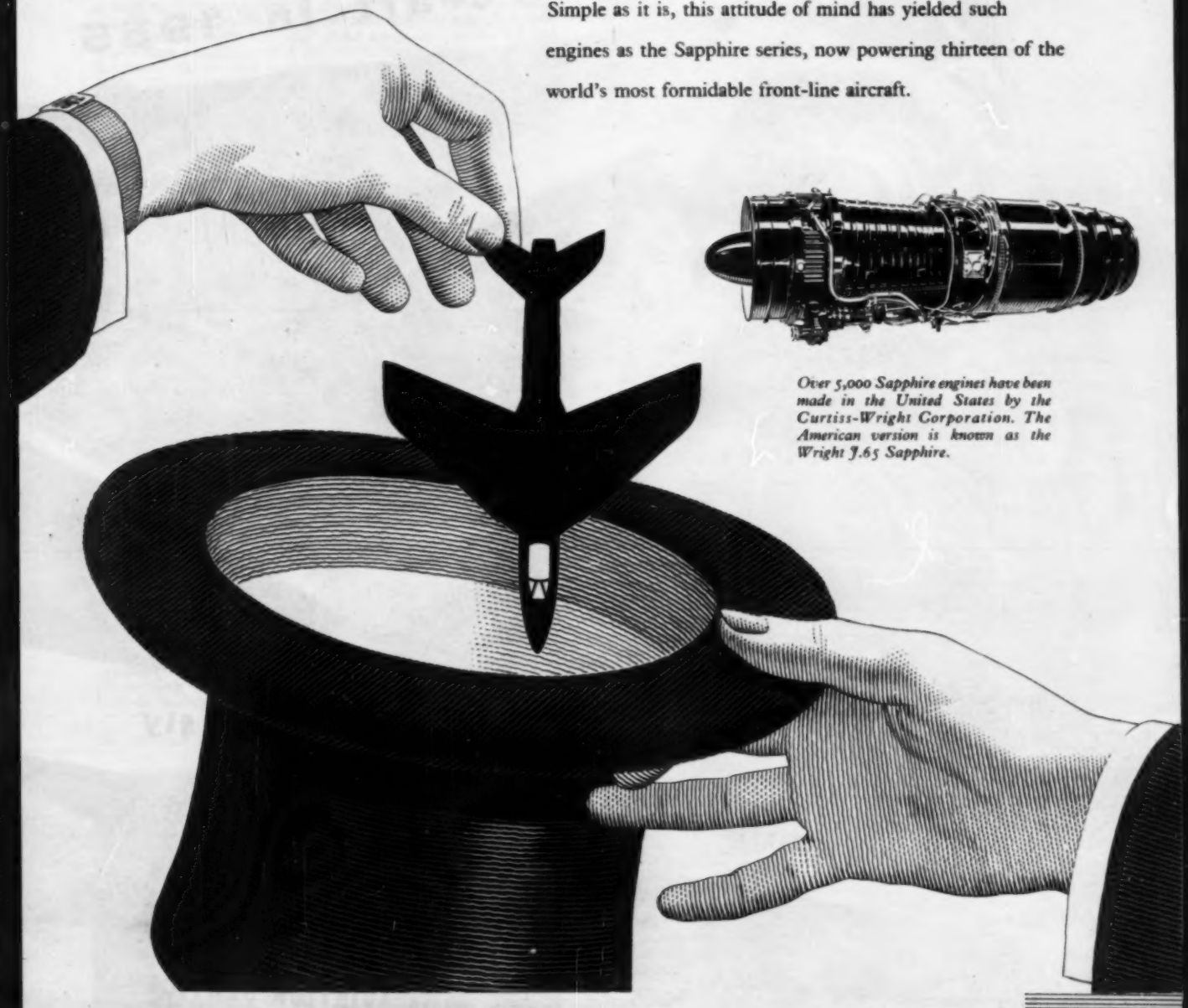
In the CV-340, like the earlier CV-240, the exhaust was ejected

Close-up of the new exhaust outlet on the Metropolitan and (right) No. 1 Pratt and Whitney Double Wasp being started.

No margin for magic...

We do not believe in short cuts. There is no magic in our method, no mystery in our formula for progress in the air. To meet a set of known requirements we design an aircraft engine. Then, meticulously and with constant re-examination of our thinking and its results, we test it. When, and only when, its practicability is proven beyond doubt, we extend its performance and scope by continuous, painstaking development. Simple as it is, this attitude of mind has yielded such engines as the Sapphire series, now powering thirteen of the world's most formidable front-line aircraft.

Over 5,000 Sapphire engines have been made in the United States by the Curtiss-Wright Corporation. The American version is known as the Wright J.65 Sapphire.



ARMSTRONG SIDDELEY AERO ENGINES

ARMSTRONG SIDDELEY, COVENTRY & BROCKWORTH

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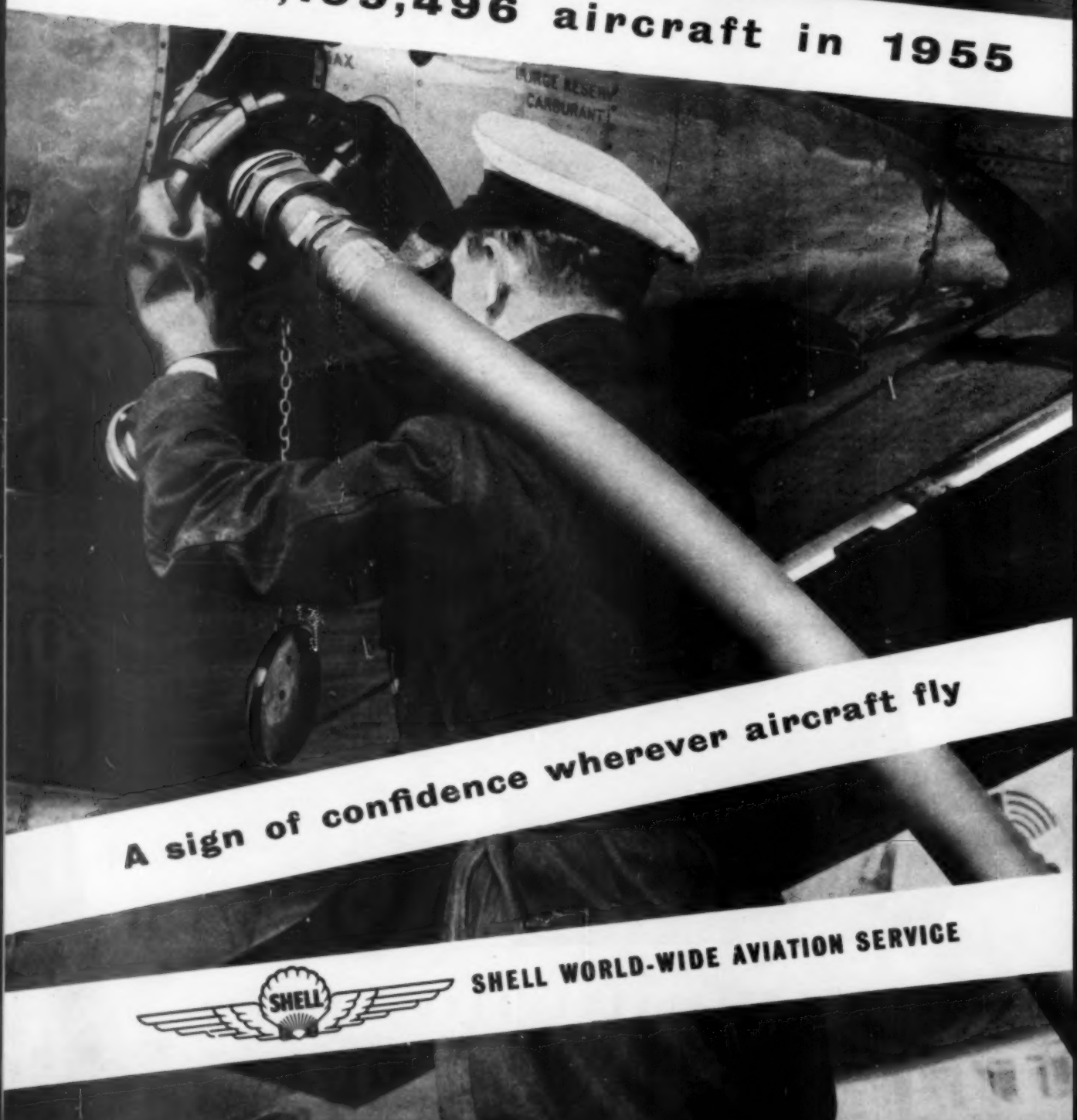
Shell Aviation Service fuelled

2,199,496 aircraft in 1955



A sign of confidence wherever aircraft fly

SHELL WORLD-WIDE AVIATION SERVICE

The administration building and control tower at Helsinki Airport.

FINLAND'S AIR TRANSPORT . . .

via two circular section thrust augmentor tubes protruding from the upper side of each engine nacelle and in line with the sixth row of seats from the front of the cabin. This system produces a high noise-level in the rear of the cabin and it is difficult to hold a conversation in the after half of the aeroplane. In the CV-440 the exhaust tubes have been fed into a muffler with a perforated inner skin and fireproof wool packing between its inner and outer walls. The exhaust is finally ejected *via* a horizontal slit at the rear of the extended nacelles, now in line with the seventh row of seats. The new system has certainly reduced the sound level and it is easy to talk even in the galley aft of the main cabin.

Certain aerodynamic cleaning has also taken place. This includes the forward lengthening of the engine cowling and reduction in air intake size, the filling of the gap between wing and ailerons, and some small flap modifications. These alterations have improved the climb performance and the cruise although the difference in cruising speed remains within the five per cent contract tolerance.

The modified exhaust and extra soundproofing have increased the structure weight of the aircraft by about 800 lb, but the aerodynamic cleaning has allowed an increased operating weight. Higher-grade fuel increases the permissible take-off weight still further.

The figures quoted by Finnair for the CV-340 with Pratt and Whitney R-2800 Double Wasp CB 16 engines using water injection and giving 2,400 h.p. for take-off are take-off weight of 21,300 kg (46,958 lb), and for the CV-440 under the same conditions 21,750 kg (47,950 lb). Landing weights are respectively 21,100 kg (46,517 lb) and 21,600 kg (47,629 lb). By using grade 108/135 fuel the CV-440's take-off weight can be increased to 22,250 kg (49,503 lb). The power with this grade and water injection is 2,500 h.p.

The CV-440 cruises at 225 kt at 15,000ft using 1,100 h.p. per engine, and it can fly the 666-nautical-mile Helsinki to Hamburg stage with 40 passengers and baggage while having fuel reserves in excess of the normal requirement. At present this is Finnair's longest stage and it is also the one with some of the heaviest traffic. Using the normal 15 deg of flap and at a weight of 48,450 lb the take-off runway length required by the CV-440 is 4,780ft. At 49,100 lb take-off weight 11 deg of flap must be used and the runway length needed is 5,120ft.

To sum up, though the Metropolitan is not a new aeroplane, it is a useful one, it is pleasant from a passenger's point of view, and excellent from the crew's. It is strictly an improved CV-340 but it comes into service with a fine background of successful operating experience, and its four-across seating and fine windows are certainly passenger attractions. Other good features are its built-in stairway and carry-on baggage stowage—though in our view the latter feature is not sufficiently known or publicized for it to be used to full advantage.

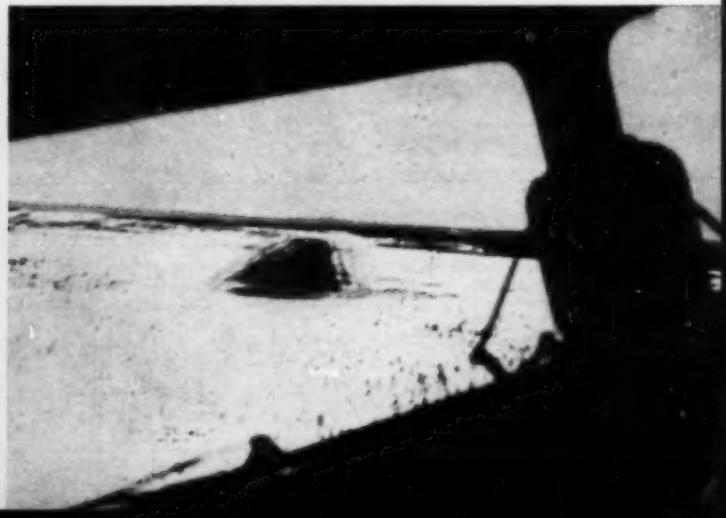
The principal domestic routes discussed in the article.

Finnair Convairs are used on the following operations:—Helsinki - Hamburg - Amsterdam - London thrice weekly; Helsinki - Hamburg - Amsterdam - Paris four times weekly; Helsinki - Stockholm twice daily; Helsinki - Copenhagen once daily; Helsinki - Moscow twice weekly; and Helsinki - Jyväskylä (domestic service) once daily. Apart from the Moscow services all Convair flights are made with two-crew operation. A radio operator has to be carried on the Moscow route. Two stewardesses are carried on all routes except that to Jyväskylä when only one is carried. Next year at least one other Finnish domestic route will be served by Convairs, by which time it is expected that the three CV-340s will have been brought up to CV-440 standard.

Our flight to Helsinki was normal and as usual very pleasant; we will refrain from description except to say that Stockholm seen from 13,000ft on a clear night is a magnificent sight and that it passed beneath far too quickly.

The Metropolitan was the main reason for our visit to Finland,

The passenger's view from a Finnish Airlines' DC-3 on the approach to Kemi. (Right) Pilot's-eye view of the runway at Rovaniemi. On either side of the runway there was still over four inches of snow.



The administration building and control tower at Rovaniemi. The airport's name on the roof is spelled out in reindeer antlers.

(Below) Post office bus and Finnish Airlines' DC-3 at Rovaniemi. The bus, which provides the airport-to-town transport, crosses the Arctic Circle on each run.

FINLAND'S AIR TRANSPORT . . .

but in fact it was the domestic operations of Finnish Airlines that we found to be of greatest interest.

Finnish domestic airline operations began in the summer of 1937 when Aero O/Y opened Helsinki to Viipuri and Helsinki to Tampere services, using its newly acquired Dragon Rapide OH-BLA *Salama*. In the summer of 1939 the domestic routes were from Helsinki to Imatra *via* Viipuri, and Helsinki to Kemi at the head of the Gulf of Bothnia *via* Tampere, Vaasa and Oulu. International operations had been inaugurated as far back as March 1924 when a route operated by Junkers F.13 was opened between Helsinki and Reval.

In 1940 Aero O/Y extended its domestic operations to Rovaniemi on the Arctic Circle and Petsamo on the Arctic Ocean. However, the second Russo-Finnish war caused a curtailment of services, although the company managed to operate some international routes.

Following the war a fleet of DC-3s was acquired and, after the retirement of the two Ju52/3ms and two DC-2s previously used, these became the standard equipment. Finnish Airlines quickly re-established both its domestic and international services and when we first visited Finland in 1949 the following internal services were in operation:—Helsinki - Jyväskylä - Kuopio; Helsinki - Vaasa - Kemi - Rovaniemi; Helsinki - Turku - Pori; Helsinki - Turku - Maarianhamina; and Turku - Tampere. There were two flights on weekdays between Helsinki and Turku and a Turku - Maarianhamina - Stockholm service doubled the frequency over the Turku - Maarianhamina sector; otherwise all these routes were served once in each direction on weekdays and the Kuopio route was operated only in summer as was the Kemi - Rovaniemi sector.

Twenty-one-passenger DC-3s were used on all services and the number of sector seats offered weekly that summer was about 2,770.

Since that time the growth of Finnish domestic air transport has been fantastic. This summer Aero O/Y is serving 13 Finnish towns and cities in addition to Helsinki, while good bus/air connections bring a further dozen places into the network of air services. All routes are operated daily and most of them have at least two daily services, while some have as many as five flights in each direction. The DC-3s now have 26 seats, and on the Helsinki - Jyväskylä route one of the three daily flights is made by a 44-seat Convair. The number of sector seats offered weekly this summer is about 11,350.

In 1937 on its domestic services Aero O/Y flew 74,464 km and carried 1,432 passengers; in 1949 the comparative figures were 789,895 km and 33,983 passengers. Last year 3,240,732 km were flown and 184,543 passengers carried on domestic services—an increase of more than 500 per cent in the number of passengers carried in seven years. Freight carried on these routes rose from 75,509 kg in 1949 to 537,663 kg last year. Mail loads have increased more than 300 per cent in the same period. These figures are extremely high when it is remembered that the entire Finnish population numbers only slightly more than 4,000,000. In the United Kingdom last year B.E.A. carried 992,000 domestic passengers out of a population of some 50,000,000. In fact Finland has the second largest network of domestic air services in Europe, the size of this network only being exceeded by that in the United Kingdom.

In addition to the operations of Finnair a second company, Karhumäki Airways, is also flying regular scheduled services. This company, with a fleet of three DC-3s (one of them OH-VKB being the SE-BAC delivered to Swedish Air Lines in 1937), has services linking Helsinki and Joensuu, and Helsinki and Tampere. The Joensuu route is flown once each way on weekdays, with a call at Lappeenranta in summer, and the Tampere route is flown four times a week with a service every weekday in summer. Karhumäki also flies between Tampere and Stockholm. Last year the company flew 318,626 km on its domestic routes and carried 15,624 passengers. During July its load factor reached 84.5 per cent.

During our visit to Finland we flew from Helsinki to Jyväskylä on the inaugural Convair service (April 22), and from Helsinki to Rovaniemi *via* Oulu and Kemi. Our outstanding impressions were the simplicity of operation, the high load factors, and the punctuality of arrivals and departures.

Flying over Finland even for short periods gives the key to the popularity of air transport in that country. Most of the southern part of the country is an intricate tangle of land and lakes, the most-quoted figure for the number of lakes in Finland being 60,000, with most of them in the south. The only direct route from one town to another is by air; all the other means of transport such as buses, trains and boats have to undertake beautiful but time-wasting meanderings before their journey is completed.

In Finland not only has the aeroplane made travel infinitely speedier but, by connecting places which before had no natural links, it has created traffic and brought added prosperity to them.

A typical comparison of transport times is for the route from Helsinki to Jyväskylä which is about 150 miles in a straight line; the Convair time between these points is 55 min, while the bus takes 7½ hr and the train about 9 hr.

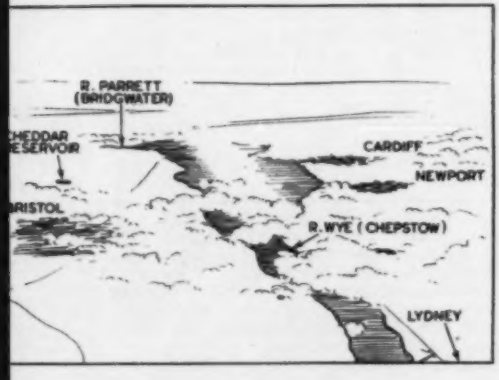
An added impetus to air travel has been given by the rational scheduling of the airline which on most routes makes it possible for passengers to arrive at their destination at either end of the route at an early hour, fulfil their commitments, and return home later the same day. This applies even to the Rovaniemi route.

Fares are low and work out at about 3d a mile. The 45 min flight from Helsinki to Turku costs 1,700 Finnmarks which is just under £3 at the normal rate of exchange, or less than £2 to British travellers who receive 900 marks to the £1. Ground transport between town terminals and airports is provided without charge on the domestic routes, but food and refreshments are not supplied except between Helsinki and Oulu, where there is a charge of 150 marks.

SKYLANCER FLIGHT-TESTED

PROTOTYPE of a new supersonic all-weather fighter for the U.S. Navy, the Douglas XF5D Skylancer flew for the first time on April 21 (the news has only lately been released). Company test pilot Bob Rahn was in charge during the one-hour first flight from Edwards A.F.B., and the aircraft has since flown supersonically many times.

Derived from the F4D Skyray, the F5D is larger, and has thinner aerodynamic surfaces and a taller vertical tail. In the prototype the engine is an afterburning Pratt and Whitney J57, but production machines will probably have either a J75 or a G.E.79. The new fighter has outstanding climb and range.



OBLIQUE AND VERTICAL

High-altitude Photography: Two Remarkable Specimens

THE upper picture, an infra-red photograph secured for *Flight* by John Yoxall from a No. 18 Sqn. Canberra at 45,000ft, is noteworthy for its range: as the sketch-map shows, it covers some fifty miles of the Severn Estuary. Major towns can be seen as dark patches, darker than the cloud shadows. The white appearance of the landscape is a characteristic of infra-red photography.

Again from 45,000ft, but this time vertically, is a striking view of the Columbus River near Washington, Missouri, with hills looking like a plaster relief map and sandbanks showing as white patches. Taken from a McDonnell RF-101A Voodoo high-speed reconnaissance aircraft, it is believed to be the first published "supersonic" photograph other than those recorded by cameras in high-altitude research rockets.

Closing the gap—three stages of retraction. Note the nylon brush strip and the Goodyear disc brakes.

WHEEL AWAY

Transair Wheel-well Doors Improve DC-3 Performance

MODIFICATION of transport vehicles is a hobby of long standing, for new ideas bring improvements which can often be incorporated with advantage into many an old faithful. The Austin Seven may sport hydraulic brakes or just a six-man ashtray, but aircraft modifications must offer some substantiated improvement in order to be accepted and incorporated. That optional modifications, as ubiquitous as those for the Ford engine, have been devised for the DC-3 Dakota is hardly surprising, for real gains in performance can be provided by refinement of the sound original airframe.

Transair, of Croydon Airport, have been shrewd enough to realize that the open wheel-wells of the standard DC-3 contribute about one-sixteenth to the aircraft total drag. Fairing in this space can give an increase in take-off, climb, and cruise performance, and a greater payload over longer stage length.

The WAT curves (Figs. 1 and 2) reproduced below show how the take-off weight penalty under high-altitude and high-temperature take-off conditions can be reduced when the Transair wheel-well doors are fitted to seal the wheels into the cowlings. In the example shown, a gain in gross take-off weight of over 1,000 lb is claimed. The weight of the door installation of 70 lb must be taken into account when assessing from the curves the payload improvement. These gains are due to 15 per cent improvement in single-engine climb which is available when the drag is reduced, but the accrued advantage of an increased cruising speed of approximately 9 m.p.h. also saves about 4½ gal (32 lb) of fuel per hour.

Fig. 3 is self-explanatory: a gain in payload will be obtained on any stage length greater than 350 miles. For shorter stages the improved performance is outweighed by the slightly increased all-up weight.

Again reminiscent, perhaps, of motor car rejuvenation, is the sandwich construction from which these doors are made, and which provide a smooth surface and contour around the wheel.

The doors are constructed (from glasscloth and resin) by Thermo-Plastics of Dunstable, but local stiffness has been provided by metal plates, and a thick layer of Hycar is sandwiched between the glasscloth laminations. The doors were strong on test—they deflected only slightly when heavily loaded—and are only one-third of the weight of the fabricated light-alloy doors for the prototype installation.

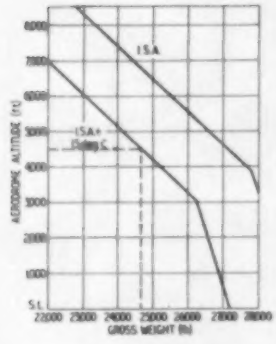
Of particular interest is the nylon brush sealing-strip, which is Pop-riveted to the joint edges of the hinged doors. An innovation by Transair, these brushes ensure that the doors are a snug fit against the wheel. It can be seen from the photograph that the wheels-up protrusion feature of the standard Dakota is in no way impaired by the modification. A third door is rigidly attached to the undercarriage diagonal member, and seals the rear well when the legs are retracted.

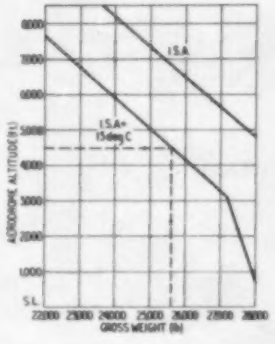
The method of retraction is quite straightforward. Each hinged door is supported by a diagonal strut, the forward end of which is attached to a vertical, bungee-loaded slide. The head of this slide consists of a down-lock trigger which is released when contacted by the retracting lower truss of the undercarriage. The trigger mechanism contains a weak link to avoid interference with the undercarriage should there be any tendency for the doors to jam, and this system has been approved by A.R.B. The door retraction time is about two seconds, and no up-lock is necessary.

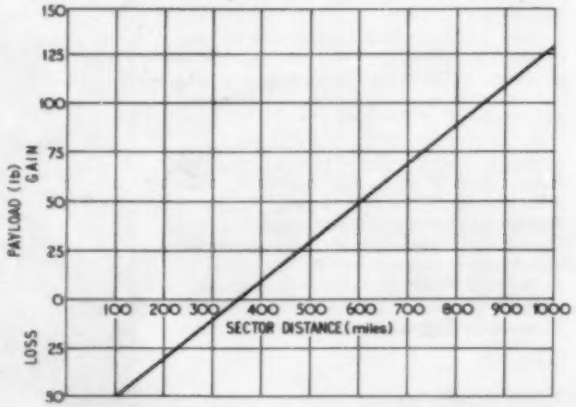
Transair pilots report that no handling changes are perceptible in aircraft to which the doors have been fitted.

The company have to date modified five of their Dakotas, and expect to complete their fleet by the end of this month. Greatly encouraging, they say, are the 115 firm orders for kits of parts received in the first two months that these have been offered, and the considerable interest that has been displayed by many operators. Export prospects are good.

Figs. 1 to 3. Displayed graphically are the maximum take-off weight for altitude and temperature "WAT curves" and the payload gain possible with Transair wheel doors. Chief benefit is improved single-engined climb.







Where drama is out of place

Wind-tunnels, computers, slide rules and test-rigs are all very well, but the only final test of an aeroplane is to fly it.

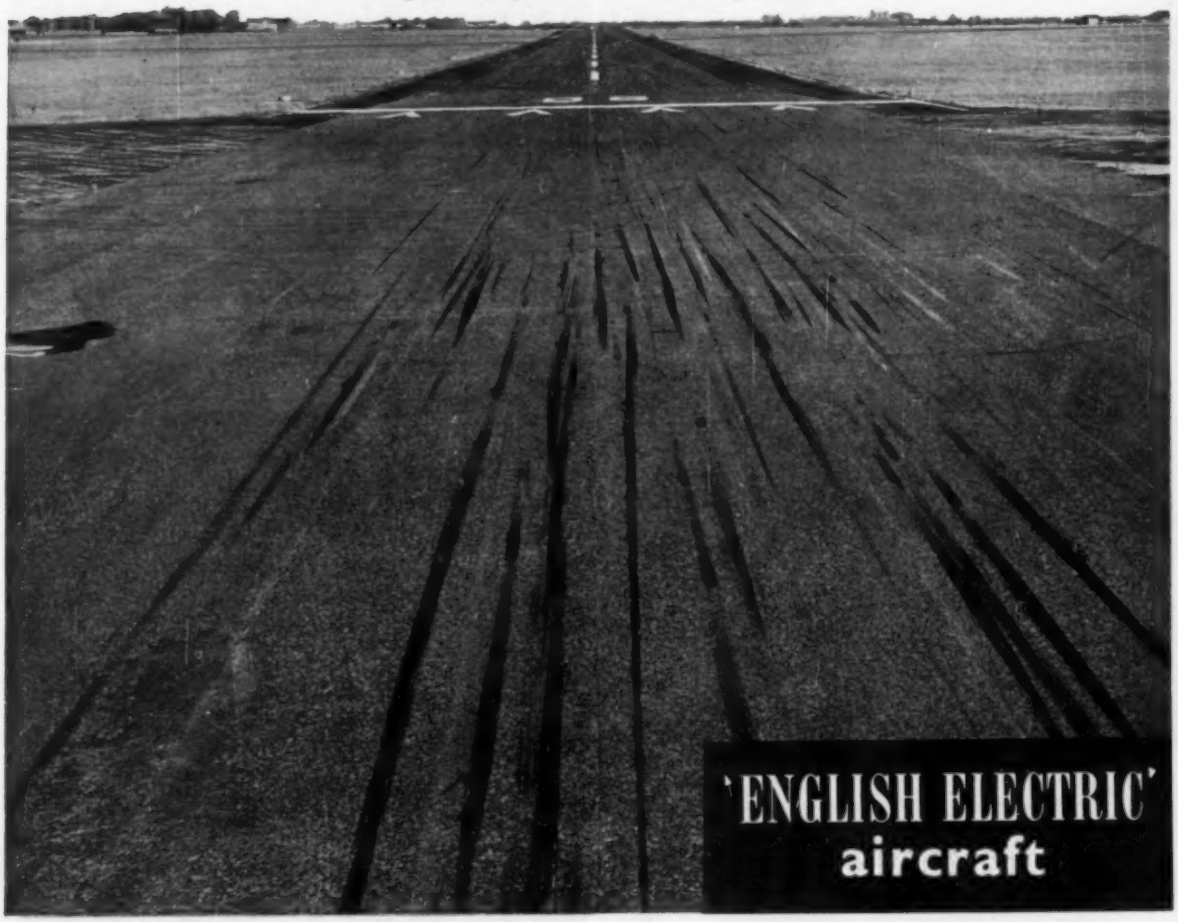
It does not need vast equipment to work out in advance how far, fast and high an aeroplane can be expected to fly, but not even the resources of our research establishment at Warton can precisely predict *how* it will do these things. The final verdict must come from the test pilot who flies it, backed up by the records of the instruments carried on every flight.

Ingeniously compact and versatile though these instruments are, there is never room enough to record at one time all you want to find out. Planning has to begin long before the first flight of the first prototype. Thereafter every single flight has a planned purpose, though there must always be enough flexibility about the plan to let unexpected findings be explored.

But whatever the instruments say, the last word lies with the test pilot. Unless an aeroplane does all it has to do in a way that is acceptable to the human being inside it, it might as well never have been built.

The job of the test pilot is one of great skill, extreme concentration and much less glamour than the films would have us believe. And however lonely his job may seem, he is very much part of a team—the team that has been working so hard and so long and so objectively to see that (in his own words) he has no moments of drama.

Design starts from an attitude of mind



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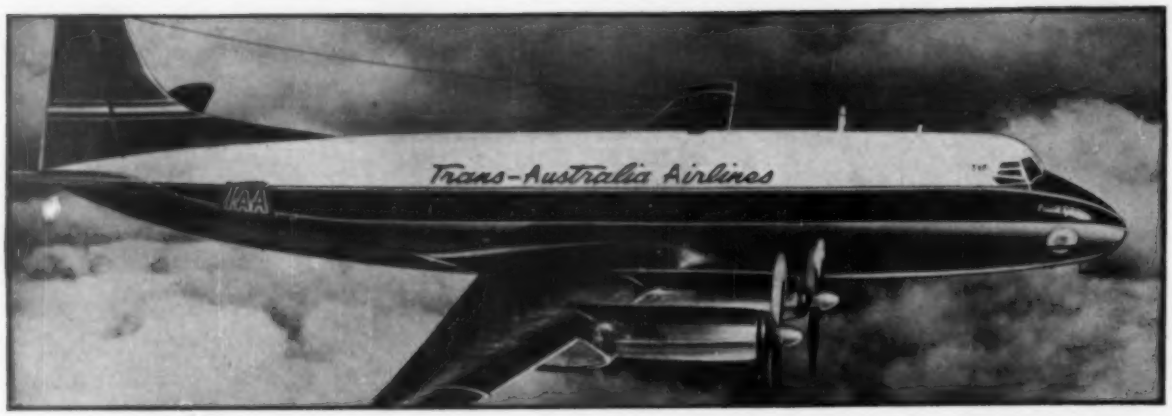

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CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns; the names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

Shock-wave Shock

HOW visible is a shock-wave? The other day I was No. 4 in a battle formation of four aircraft. We started a dive from about 40,000ft, and during the dive, in which all four aircraft exceeded Mach 1.0, I looked towards my No. 3, who was up sun to me slightly. From the centre of his fuselage there was a faint line, curving gradually backwards, about thirty feet high, looking rather like an extremely long whip aerial.

When we got down no one seemed to know whether I had been seeing things or whether this was a rare or common phenomenon.

2nd T.A.F., Germany. MECURE GALANT.

Putting It Over

WITH reference to your editorial in *Flight* of June 8, I should like to say how heartily I agree with your suggestion that Britain must do better at international air shows. At the recent show at Butzweilerhof, near Cologne, the apparent lack of interest on the part of the British aircraft industry was very noticeable. Apart from service entrants, two helicopters and a few other "light" aircraft, Britain was poorly represented. No Britannia, Viscount or Comet. The French, on the other hand, produced several transports, including the Caravelle. I am sure there were many British spectators who like myself left disappointed at not seeing one of our "big three."

B.A.O.R. 19. PETER W. VOLLBORTH.

S/L. Runciman—an Appreciation

I WOULD like to pay tribute to the memory of Wally Runciman, who was a fine man and a gallant test pilot and will be sadly missed by everybody at Shorts. We all felt the same way about him, his fellow test pilots, the Board of directors, the design team and the men who serviced his aircraft. Wherever he was known, and he had become widely known throughout the industry, he was universally respected.

He was essentially a quiet, unassuming person who, nevertheless, could be surprisingly emphatic when necessary. He was a methodical and hard-working test pilot who knew his job and possessed the courage and determination to see it through. Above all, he had a high sense of duty and made sure that any aircraft which he had tested would be safe in the hands of a less experienced pilot. The nation owes much to men like Runciman.

Our deepest sympathy goes out to his wife, Edwina, and to his three children, all of whom have given so much in the cause of aviation.

Belfast. DAVID KEITH-LUCAS.

[Mr. Keith-Lucas is a director and chief designer of Short Brothers and Harland, Ltd.; Walter Runciman, killed in a flying accident on June 9, was one of the firm's senior test pilots—Ed.]

D.H.9s

THANKS to Mr. W. H. Mares' letter [*Flight*, June 8] and photograph of a de Havilland D.H.9 variant, no doubt more will be revealed. I have a picture of this particular three-seater example in my own collection taken before it was painted mauve. Personally I have no objection to such a shocking colour—in fact, I go so far as to suggest that aircraft, in view of flying safety, should be painted in fluorescent colours.

Among my photographs of D.H. types I have a 9A which appears to have tapered trailing-edge wings and a humped back near the gunner's cockpit. The engine is a typical Napier Lion. The D.H.9B (G-EBAN) has a 360 h.p. Rolls-Royce Eagle engine and looks rather longer than usual. The D.H.9C (G-EBAX) has an enclosed humped-backed cabin. Yet a third is powered with an Armstrong Siddeley Serval IV radial engine. What is described as a 1924 D.H.9C differs from G-EBAX in having the pilot's open cockpit *aft* of the enclosed cabin, almost within reach of the tail fin. I have, too, a photograph of a D.H.9 with a high-built undercarriage as distinct from the Vickers oleo undercarriage depicted in Mr. J. M. Bruce's last series.

A little known variant of the D.H.9 was another hump-backed ambulance for carrying a stretcher case in addition to the pilot and an attendant. Finally, the best of the collection is a Westland built D.H.9A festooned with "Christmas trimmings" and carrying a spare wheel on the side of the engine cowling—believe it or not! Once again I would like to thank Mr. Bruce for his historical series.

Birmingham, 14. MAURICE AUSTIN.

Recognition Problem

ON Thursday, June 14, at 1115 hr, I saw a twin-engined high-wing monoplane cruising around over North London for an hour or so, apparently aimlessly, at an estimated 100 m.p.h. and between 600 and 1,000ft. The aircraft had a typical square section freighter fuselage and a narrow single boom carrying its tailplane; mid-set straight-tapered wings with engines situated close to the fuselage and protruding forwards only, and extremely large additional flaps. Tailplane with tapered trailing edge, small square-cut central fin and rudder and two auxiliary fins at tips. Fixed nose-wheel and two pairs of main wheels fixed not to undersides of wings but under the fuselage; no bracing struts of any kind visible. Light green in colour; markings were difficult to discern, but I think the letters were G-AJAP.

Though similar in proportion to the Blackburn Beverley and Universal it appeared to be considerably smaller and was definitely not a Fairchild Skyvan or the Miles Aerovan. A low angle of attack to climb was noted, also the aircraft appeared to be underpowered and its gliding capabilities seemed to be playing an important part in its flight.

London, N.13. COLIN M. T. LAMB.

[Our correspondent's description suggests that the machine was, in fact, an Aerovan. The registration he mentions does not appear in the current register.—Ed.]

Matane Air Services' Routes

IN your World Airline Directory of April 20th you put forward the possibility that our company is no longer flying regular services from Matane to Franquelin, Godbout, Trinity Bay, Pentecote and Shelter Bay. The fact that Quebecair are reported to serve these same points is no justification for such a surmisal; there are innumerable other examples throughout the world of regular services being operated in parallel by two or more companies.

We would like to point out that our company is the only one operating daily-except-Sunday services to the points mentioned above, and we have been doing so consistently and without interruption since 1952. Quebecair have only recently resumed with a once-weekly service. We estimate that we are carrying between 80 and 90 per cent of the traffic on this route.

Our traffic has increased to such an extent that we were obliged to purchase a second Lockheed Electra in January 1956. This has proved insufficient for our requirements, and a third Lockheed Electra was purchased in May.

With regard to our route, we would like to point out that, far from abandoning this regular service, we are presently seeking permission to extend it to a sixth point on the opposite shore of the St. Lawrence River, Baie Comeau. This application is now before the Canadian Air Transport Board.

Matane, Quebec. MATANE AIR SERVICES, LTD.,
G. Burnett, managing director.

FORTHCOMING EVENTS

June 28-30. Aero Club of Massa Apuania: Air Rally.
June 29-July 1. Pescara Aero Club: Fourth Annunzio Trophy.
June 29-July 13. World Gliding Championships, St. Yan, France.
June 30-July 1. Aéro-Club de Basse Normandie: Ninth Air Rally.
June 30-July 2. Royal Aero Club: Private Rally, La Baule.
July 6-14. OSTIV: Sixth Congress, St. Yan.
July 7-9. Royal Aero Club: Private Rally, Deauville.
July 14-15. Aero Clubs of Trente and Bolzano: Eighth International Tour of the Dolomites.
July 14-15. Dusseldorf Aero Club: Air Rally.
July 14-25. International Gliding Competition, for the Coupe Jacques Coeur, Bourges.
July 15. Royal Belgian Aero Club: International Gliding Competition, Namur.
July 15. R.Ae.S.: Garden Party, Wisley.
July 18-22. Venice Aero Club: International Aeronautical Exhibition.
July 21. R.Ae.C.: National Air Races, Third Round (including King's Cup Race), Baginton, Coventry.
July 21. R.N.A.S.: Lossiemouth: At Home.
July 21. R.N.A.S. Anthorn: At Home.
July 22. Northamptonshire Aero Club: At Home.
July 22. Yorkshire Aeroplane Club: At Home.
July 28. R.N.A.S. Yeovilton: At Home.
July 28. R.N.A.S. Culdrose: At Home.
July 28-30. Livorno Aero Club: Air Rally.
Aug. 1-12. Central Aero Club of U.S.S.R.: World Parachuting Championships, Moscow.
Sept. 3-9. S.B.A.C. Display, Farnborough ("Public" days, 7th, 8th, 9th).

THE INDUSTRY

Hundredth Sycamore Delivered

THE Weston-super-Mare factory of Bristol Aircraft, Ltd., has just delivered—to the Joint Experimental Helicopter Unit at Middle Wallop—the 100th Sycamore helicopter to be built. It is the fifth machine made at Weston.

The concentration of all Bristol helicopter activities at the seaside factory will make it one of the largest centres for helicopter production, research and flight testing in the United Kingdom. The move has been made in order to provide additional floor space for Britannia production at the Filton works and to permit expansion of the helicopter programme.

Transfer of work was begun last autumn when certain key personnel from the helicopter department at Filton joined the production and planning department at Weston. In addition to Sycamore production, work is already in progress on twin-engined tandem-rotor helicopters, one version of which is on order for the R.A.F. Additional floor space will shortly become available for helicopter production. Ministry of Supply armament contract work at present handled at Weston is scheduled to end in the near future, and certain Britannia sub-assembly work is to be transferred to Filton and Belfast.

Production space which will become available in the main sub-assembly shop will be taken up by metal rotor-blade manufacture, and a treatment shop is being built to provide facilities for advanced methods of aircraft skin and metal blade treatment. The helicopter design office will also be centred at Weston and the mechanical assembly department will be transferred there.

New flight-shed extensions, to be used for detail and final painting of aircraft, are now nearing completion. The company has installed the latest type of paint booth, in which warm air is circulated to provide the "flash-off" for the paint and is water-washed to extract superfluous paint before re-circulation.

Test rig gantries are being transferred from Filton and a new helicopter test tower is being built. Flight development work on Type 173 experimental aircraft, which are devoted to intensive research into the twin-engined tandem rotor configuration, will be carried out at Weston. For this purpose, and also to handle production flight testing, Mr. C. T. D. Hosegood (chief helicopter test pilot) and other members of the Bristol helicopter flight test team will be stationed at Oldmixon.

The Weston works, built in the early days of the Second World War, already has an outstanding record of Bristol aircraft production. In all 3,300 Beaufighters were built there; when production was at its peak, they were produced at the rate of 25 a week.

Pullin-Kearfott Agreement

THE precision instrument manufacturers, R. B. Pullin and Co., Ltd., have concluded an agreement with Kearfott company of the U.S.A. for the manufacture in this country of a range of Kearfott products, including synchros, servomoters and other precision mechanical, electrical and electronic components. Manufacture will take place in the new buildings erected at Pullin's Phoenix Works on the Great West Road, Brentford, Middx. Kearfott are a subsidiary of the General Precision Equipment Corporation group.

From Donvin Instruments, Ltd., now a member of the Pullin group of companies, comes news of a "crash" repair scheme for most types of switchboard and portable electrical instruments and test sets. Such repairs can be undertaken within 48 hours of receipt subject to examination and the availability of spare parts. Donvin Instruments, Ltd., operate from Electrin Works, Winchester Street, Acton, London, W.3.

Sycamores on the line at Weston (see first item above).

George Lowdell Rejoins Vickers

FROM Vickers-Armstrongs (Aircraft), Ltd., comes the announcement that Mr. G. E. Lowdell, their former chief production test pilot, has rejoined them as a member of the after-sales service organization. Mr. Lowdell first joined Vickers in October 1941 as a test pilot and after a short time at Weybridge and Eastleigh went to Castle Bromwich for two years, test-flying production Spitfires and repaired Wellingtons. In 1943 he transferred to Blackpool as test pilot in charge, handling Wellingtons. Two years later he returned to Weybridge as chief production test pilot, retiring from flying in 1953. Mr. Lowdell did considerable development flying on early Vikings, flew the Nene-engined Viking and Tay-Viscount and demonstrated Valettas, Varsities and Viscounts at Farnborough displays. In his new appointment he will be mainly responsible for relations with pilots of customer airlines, with senior engineers visiting the Weybridge Aircraft Service School and with resident technical representatives.

Mr. Lowdell.

Moulton Development Project

A NEW company, Moulton Developments, Ltd., consulting and development engineers, is being formed by Mr. Alex Moulton, M.A.(Cantab.), M.I.Loco.E., A.I.R.I., technical director of Geo. Spencer, Moulton and Co., Ltd., "in order to develop important new engineering projects in the transport field." The new company will operate in premises on Mr. Moulton's property at The Hall, Bradford-on-Avon, Wilts, and will be independent of Spencer Moulton. Though Mr. Moulton will be relinquishing his directorship of that company, Moulton Developments will act as consultants to it in a number of spheres. Mr. Philip Turner, M.A.(Cantab.), B.Sc.(London), A.I.R.I., who has for some years been associated with the new products development of Spencer Moulton, will be chief engineer of the new company.

IN BRIEF

Egyptian Aviation and Travel Services, a Cairo-based organization, have bought 24 David Brown aircraft-towing tractors—the largest order for such machines so far received from Egypt. The order comprises sixteen 30 IC petrol engine machines and eight 30 ID diesel tractors fitted with turbo transmission.

* * *

Much development work is going on at Dunlop's aviation division in connection with guided missiles, Lord Baillieu, the chairman, told the annual general meeting recently. "Special equipment," he said, was already being produced for several of the leading manufacturers.

* * *

Among catalogues and service manuals recently issued by King Aircraft Corporation, of Hillington, Glasgow, S.W.2, are those describing pipe clamps, flush-fitting panel latches, couplings for flexible fireproof pipe, filler caps, arctic-type cowling fasteners, oil filters, fuel filters and an electrically operated inertia lock.

* * *

A new type of self-contained, portable, foam fire-fighting appliance has been announced by the Pyrene Co., Ltd., Great West Road, Brentford, Middx. The new appliance, Model A.F.30C, is a trolley-mounted unit of 30 gallons capacity which produces more than 400 gallons of mechanical foam under CO_2 pressure.

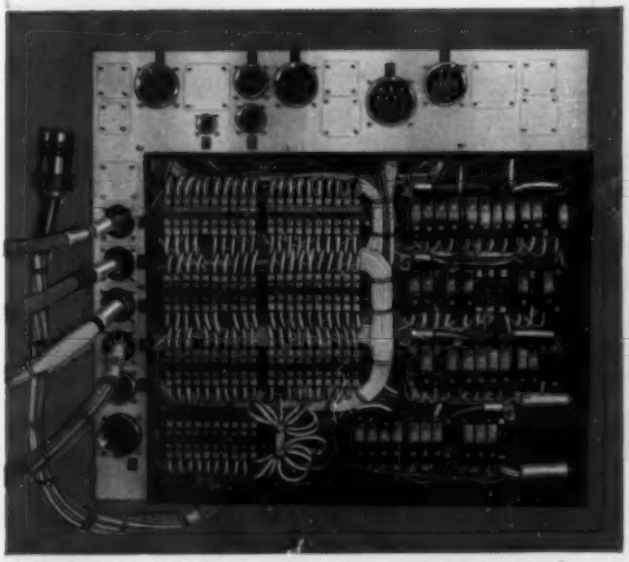
* * *

The appointment of Mr. M. W. Boyce as managing director of Black and Decker (Australasia) Pty., Ltd., a subsidiary of the parent company at Towson, U.S.A., has been announced by Black and Decker, Ltd., manufacturers of portable electric tools. Mr. Boyce has for several years been marketing manager of the latter company at Harmondsworth, Middx., where he will be succeeded by Mr. J. P. Jamieson.

* * *

Mr. J. C. Atkinson, who had been since 1925 a director of the Radio Corporation of America, British Division, recently resigned and joined the Board of Thermionic Products, Ltd., and their associated companies. Thermionic Products have for a long time been designers and manufacturers of airport recording equipment, magnetic dictating and recording equipment, and specialized electronic equipment.

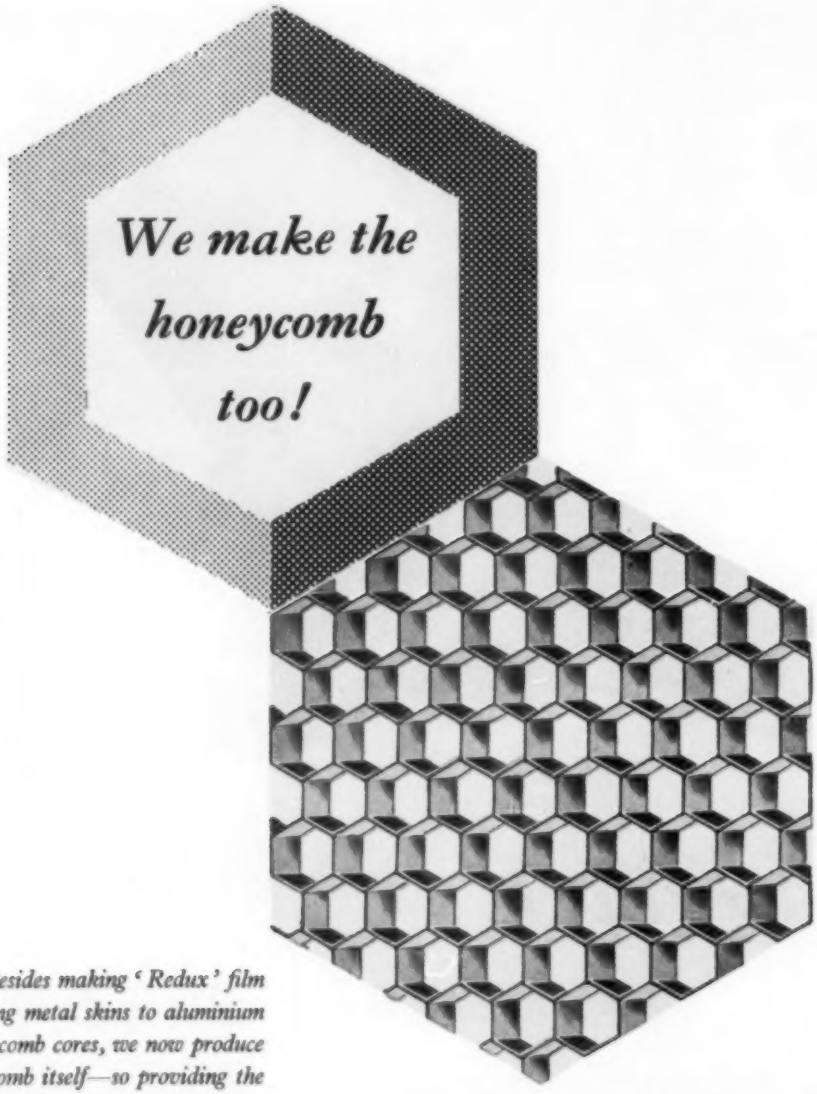
THE JAVELIN RELIES ON Plessey JUNCTION BOXES



The box illustrated—one of the seventeen Plessey junction boxes employed on every Javelin—has 242 separate wires, 439 crimped joints, 19 outlets and uses 740 feet of cable.

THE PLESSEY COMPANY LIMITED • ILFORD • ESSEX

A65



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Aero Research Limited *A Ciba Company, Duxford, Cambridge. Sawston 187*

AP. 264-21C

CIVIL AVIATION

COLD COMFORT

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With this aim, three cowlings are to be reprofiled internally to provide a smoother surface. This will obviate ice accretion pockets. The unmodified cowling will serve as a reference during the further tropical trials which will take place in July. It is expected to have the aircraft in passenger service on the South African route by early October, and on the Australian route a month later.

DOWN TO EARTH

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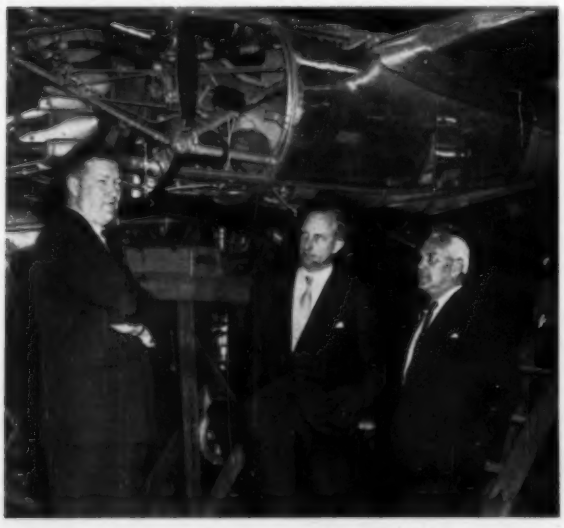
Discussion, aided by a Dutch contribution of a working paper, failed to determine the best of these systems on the results of the simulator trials alone. Full-scale installation soon to be made of the A.L.P.A., Calvert and Dutch approach systems will, however, provide opportunity for pilot assessment; in the meantime, the Federation's policy of a centre-line-and-bar approach light system seems unlikely to be changed.

In the past, runway lighting systems were criticized on the score that leaving the approach-light system placed the pilot in a "black hole," and this had led to the idea of "landing mat" lighting.

In general, the meeting favoured a landing mat consisting of two lateral rows of lights on 75ft centres, with horizontal bars to give lateral guidance and, in addition, some form of distance guidance. Once again it was felt that full-scale tests should be made before any theoretical system was adopted. A simple horizontal bar was not, however, considered to be adequate threshold marking and, in order to provide "area" marking, a sleeve of green lights extending the width of the concrete and along it each side for 100-200ft was thought to be desirable.

Additional lighting for the optimum touch-down point was agreed to be unnecessary where successive transverse bars are used, although the illuminated green "T" on either side of Schiphol runway was admired. Standardization of end-of-runway markings, which was needed, could be expected to be in the form of a warning light or bar situated 200 yd from the end of the concrete.



Location of the I.L.S. reference point was the subject of further discussion; this is currently regarded as being less critical than earlier I.F.A.L.P.A. studies have assumed. In order that the maximum benefit be gained from the approach lights, however, the majority of the meeting agreed that the reference point should be resolved with the angle of glide path at each aerodrome, which in turn should be standardized and the tolerances reduced.

No resolution was passed on these lighting discussions, which will, however, form a valuable contribution to the final briefing meeting that will be held before the sixth A.G.A. Divisional Meeting of I.C.A.O.

More power to their ALBO: Britannia prototype G-ALBO photographed at Idris Airfield, North Africa, during the Proteus 755 (outboard) and 705 (inboard) turboprop test programme; 30 hours' flying were logged.

LUFTHANSA IN LONDON

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So many factors now influence an airline flight plan that about 2½ hr may be required to complete it. The question of airfield alternatives, for example, requires considerable study, since wide diversion of the fleet is obviously unsound, and Customs and immigration facilities must be available if the passenger is not to be unduly delayed. These decisions have consequently become the sphere of the man on the ground, although the pilot still retains final responsibility, and can exercise his veto if conditions warrant. This is not, however, universal practice—American procedure demands the signatures of both the pilot and the flight operations officer to the flight plan, to denote shared responsibility.

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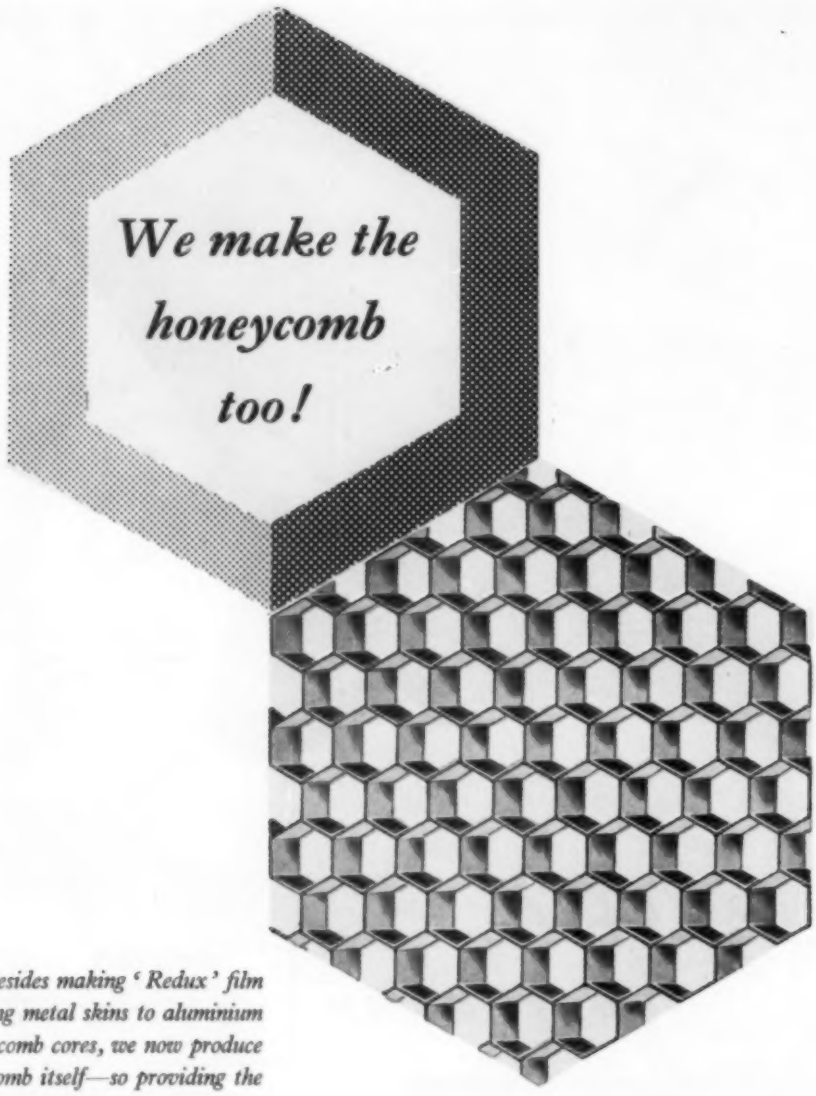
Mr. D. G. Anderson, Director-General of Civil Aviation in Australia (left) and Mr. J. Schofield, civil aviation representative at Australia House, discuss one of the Viscount's Dart RDa.6 engines with Mr. H. Sharp of Vickers-Armstrongs (Aircraft), Ltd. (right).



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Getting closer—a more intimate view of the spacious DC-8 pilots' office. (A glimpse from the flight deck appeared on page 822 last week.) Each pilot's panel contains primary flight instruments and two integrated flight instrument systems; throttles and other manual controls have been shaped, where possible, to be representative of the components they operate. Systems instruments and controls are manned by a flight engineer at a panel aft of the second pilot.

CIVIL AVIATION . . .

findings, based on a sample poll of 6,000 passengers flying east to Europe during February, June and September last year, show (as reported by the air correspondent of *The Financial Times*) that the average income of their 50,000-plus passengers who annually cross eastwards is £2,500, but the proportion of those with £1,800 or less (34 per cent) is far higher than those with incomes of over £5,400 (23 per cent).

Housewives form the biggest single group (26 per cent) of T.W.A.'s east-west travellers, followed by the "executive/managerial" and the "teacher/student" class, though most of the latter do their travelling in the peak summer season. Businessmen make up only 11 per cent of summer-season passengers, but they are the most consistent group in year-round monthly volume (700-900). Professional men—doctors, lawyers, etc.—follow with 10 per cent.

Why do these people fly east? According to T.W.A., apart from the businessmen more than half its passengers to Europe have either lived there earlier or have parents who lived there. Each year, nearly two-thirds of the airline's passengers travel for pleasure. The majority of North Atlantic air travellers are American tourists bent on spending their vacation money in Europe. Last year they disbursed $1,500 m (£535,711,500) abroad, most of it in Europe.

TWO SERIOUS ACCIDENTS

WE regret to record that on Sunday last, June 24, a B.O.A.C. Argonaut crashed and caught fire after taking off from Kano Airport, Nigeria. Of the 45 people on board, 30 died—including the stewardess and one of the stewards—and a number were seriously injured.

Four days before, on June 20, the Venezuelan airline, Linea Aeropostal Venezolana, had suffered an accident resulting in one of the most serious losses of life in the history of commercial aviation. The accident was unusual in that the entire circumstances were observed from the air—by the crew of a Long Island coastguard Grumman amphibian escorting the Venezuelan Super Constellation (which had suffered a "runaway" engine) back to Idlewild. It appears to have been due to jettisoned fuel being ignited by the burning port inboard engine. In previous years, six safety awards have been made to Linea Aeropostal Venezolana.

California Eastern Aviation announce that, in the past ten years, 452,518,130 passenger miles have been logged without injury to a passenger or crew member, and the 1955 accident figures for operations by American domestic airlines show that for the fourth consecutive year the passenger death rate has been below one per 100 million passenger miles.

GILDING THE SKYLARK

ANNOUNCED as a joint undertaking of Hughes Tool Co., Delta Airlines, Convair, and the General Electric Co., is the Convair Golden Arrow medium-range jet airliner. Delivery of thirty aircraft for T.W.A. and ten for Delta has been scheduled to begin in late 1959.

These aircraft, representing contracts in excess of £70m with spares provisioning, will be powered by four General Electric CJ-805 engines—a commercial version of the successful J79 unit. A joint statement says: "The name, Golden Arrow, is derived not only from the airliner's commercially unmatched speed, but also from its planned unique and sensational employment of colour in metal. The Golden Arrows are planned to be the first aircraft to include exterior metal which is shimmering gold in colour, rather than the conventional silver colour associated with aircraft through the years." The colour is obtained by anodic dye treatment of the aircraft skin.

Previously to have been known as the Convair 600 Skylark, the aircraft was given its new name at the suggestion of Mr. Howard Hughes, who is president of Hughes Tool Co. of which T.W.A. is a subsidiary. Drawings and details of the Skylark have been released in previous issues of *Flight* (March 30 and April 27) and an up-to-date specification will be included in next week's special "Airliners of the World" issue.

T.W.A., currently taking delivery of eight Super-G Constellations, will accept 25 Super Constellation 1649As from early 1957 and in 1959 will equip with eight Boeing 707 jet Stratoliners in addition to the new Golden Arrows.

I.C.A.O. AT CARACAS

THE tenth annual assembly of I.C.A.O. was formally opened in Caracas, Venezuela, on June 19, attended by the Venezuelan President and members of his government. Present were 282 delegates from 67 countries, with observers from six nations, including Russia. The United Kingdom delegation was led by Mr. J. E. Keel, C.B. The primary technical item under discussion will be the problem of establishing suitable organization to handle the rapid growth of jet airliner traffic in the next few years.

It is reported from Caracas that Mr. O. Zapounov, senior inspector of Aeroflot, told the conference that the Tu-104 was being "mass-produced" and that three were in service between Moscow and the Far East. A further Russian announcement stated that the Tu-104 would go into regular service between Moscow and Prague or Stockholm at the end of the year. (Inter-capital flights were discussed by Mr. Nikita Kruschev, Soviet Communist party first secretary, at the Soviet Air Force Day party; he claimed that Andrei Tupolev's new 180 passenger four pure-jet engined airliner, the Tu-114, will be able to make non-stop flights between Moscow and New York or Moscow and Vladivostock, the Soviet Pacific port.)

BREVITIES

SOUTH AFRICAN AIRWAYS hope to start a new direct service between Perth, Western Australia, and Johannesburg, according to Mr. H. C. De Wet, the company's assistant manager. The service would start in September this year on the basis of one flight every two weeks for the first eighteen months, and subsequently once a week, or more in case of need.

* * *

Reports that Capital Airlines, who have 60 Viscounts on order, are to buy Comets or Britannias have been denied by Capital officials.

* * *

Pakistan International Airlines plans to extend its operations to the Middle East in 1958, using three Viscount 810 aircraft. Two series 840 machines are also on order, together representing business for Vickers-Armstrongs to a value of £1¼m.

* * *

On June 19 a Lufthansa Super-G Constellation flew non-stop from Hamburg to New York on a normal scheduled service. The flight took 14 hr 4 min and normal fuel reserves were still intact when the aircraft landed.

* * *

Tomorrow, June 30, the Society of Licensed Aircraft Engineers hold their thirteenth annual general meeting in the Assembly Hall, Mansion House, 26 Portland Place, London, W.1. Commencing at 2 p.m., the meeting will include the guest address, the presentation of awards and the presidental installation.

* * *

The Kelvin Hughes drift and ground-speed meter is to be fitted on all B.O.A.C. Britannias. The first production instrument was delivered to Vickers-Armstrongs, who fitted it to a V.I.P. Viscount ordered by the Pakistan Government. The second went to Central African Airways for their first Viscount and they have since ordered five more drift meters from Kelvin Hughes. Other overseas operators who have specified these instruments are Middle East Airlines and Indian Airlines Corporation (for their Viscounts) and Canadian Pacific Airlines (for the DC-6B and Britannia 300 L.R.).

TACAN EVALUATED

MUCH discussion has followed the second Technical Symposium on the Tacan radio navigation aid, held in Washington and attended by representatives of the Services and the airline and electronic industries from the U.S. and abroad.

The symposium was opened by an introductory talk by Mr. John L. Loeb, of the U.S. Department of the Navy. He admitted himself to be biased in favour of Tacan, but confined himself to praising the aid only in so far as it was a Naval system, designed to meet Naval requirements. This he made quite clear by stating that Tacan was developed to replace the wartime YE/YG aid. It is a pity (writes a specialist correspondent) he should have stated that Tacan is the only integrated air navigation system developed since 1948, and is therefore five years ahead of any other system. Although the Decca Navigator was initially used during the latter part of the war, as an integrated system it is far ahead of Tacan, both in its value and conception. A final point mentioned by Mr. Loeb is the fact that at least 45 Tacan ground beacons are in operation, while over 300 have been delivered.

So much, then, for the introduction. The real significance of this document lies in the views expressed by those authorities that have actually undertaken development and evaluation flying. As is now generally known, Tacan is a bearing and distance system operating in the 1,000 Mc/s band. Using conventional interrogator/responder techniques distance measurement is achieved; by transmitting a reference signal and rotating pattern, phase-comparison is used to provide azimuth information. In this service a rough and fine pattern combine to provide azimuth accuracy. A single channel is used for both bearing and distance operation.

The first series of tests to be reported upon were conducted by the Airborne Instruments Laboratory, Inc., under the sponsorship of the A.N.D.B. The equipment was sited in a number of varying positions, ranging from the near-ideal to the difficult. In addition, in one case, the Tacan beacon was located near to a V.O.R. station to enable a fair comparison to be made between their accuracies in azimuth.

One of the first results noted was the fact that obstructions near to the Tacan antenna produced undesirable effects. These included "searching" by the airborne equipment in the azimuth rôle, and bearing lock-on with "gross errors." At the site where both Tacan and V.O.R. were in operation the Tacan errors were substantially lower than those of the V.O.R. Where ground-polarization (i.e., the effect of the ground upon the signals being radiated) tests were made, the average error measured due to this cause was ± 0.7 deg. Several other undesirable effects were noted, including gross indicated bearing errors, especially in marginal areas, variations in bearing indication with the signal level, and at certain power-supply frequencies.

Due to the different type of radiation and frequency the siting problems for Tacan are different than for V.O.R., the Laboratory report states. The higher frequency of Tacan had certain disadvantages; trees and other obstructions caused greater attenuation and scattering, there was more rapid attenuation beyond the line of sight, and the attitude of the aircraft caused screening of the aircraft antenna in certain cases. However, the higher frequency permitted the antenna pattern to be shaped so that the minimum energy was directed towards the ground. This is one of the greatest difficulties in V.O.R. siting. In actual fact, considerable improvements may be gained in the case of Tacan by raising the antenna above all nearby obstructions.

The C.A.A. evaluation of Tacan clearly shows a decided preference for V.O.R./D.M.E. Approximately 120 flying hours and considerable simulated tests in the laboratory were employed in the course of the trials. The C.A.A. summarize their view by stating that Tacan provides similar information to V.O.R./D.M.E., and is subject to similar siting errors. But, owing to unreliability and complexity, Tacan is not suitable for civil use, neither can it be used economically in small aircraft, due to space and weight considerations. Furthermore, the propagation characteristics of the 1,000 Mc/s band are not reliable for Tacan service. The C.A.A. then amplified these views.

In the first place, as the Tacan and V.O.R./D.M.E. systems are incompatible they cannot co-exist. Proposals to replace V.O.R./D.M.E. by Tacan in the U.S. for the convenience of Service aviation would certainly not be acceptable in view of the thousands of users of the latter system, and the expense that would be involved. The C.A.A. took the view that although the Service evaluation trials provided much factual data, it was not possible to draw from them direct comparisons between Tacan and the civil V.O.R./D.M.E. system, especially with regard to the azimuth aspect of the two systems.

The Naval test programme conducted by the Naval Air Test Centre showed that the azimuth errors to be expected in Tacan were of the order of ± 2 deg. The C.A.A. claimed that practical experience of V.O.R. showed that the azimuth accuracy was governed by siting errors; in the absence of siting errors complete V.O.R. systems showing an overall error of ± 1 deg could be produced, while systems having an overall error of ± 1.5 deg were in current use. Another interesting point mentioned is the fact that from the reliability aspect D.M.E. is the weak link of V.O.R./D.M.E. As D.M.E. is an integral part of Tacan this must affect the whole of the system, whereas failure of the rho component of V.O.R./D.M.E. does not affect the bearing information (theta). Distance accuracy of Tacan was less than that of D.M.E.

In the course of the C.A.A. evaluation flights there were 11 occasions when the Tacan indicator started to search and then locked on to an erroneous bearing with no flag alarm warning. On one occasion this error was 160 deg, while on the remainder the error was 40 or 80 deg. (It would appear that on these occasions the inherent 40-deg ambiguity of the system, normally resolved, presented itself, either in single or multiplied form.) On these occasions the aircraft was in an area of low field intensity.

The actual weight of the Tacan airborne equipment is 72 lb against the 84 lb for V.O.R./D.M.E. But the latter facility provides for the reception of voice broadcasts, and it is well known that a combined receiver suitable for both V.O.R. and I.L.S. is readily available.

It becomes apparent from the symposium report that Tacan has several advantages over V.O.R./D.M.E. as seen through Service eyes. It is far more suitable for shipborne installation, or in a transportable form it is less of a problem from the siting point of view. It is, however, more affected by reflection than V.O.R. From the airborne information there is little to choose between the two systems, and this is the basis of the C.A.A. argument. The result would be a great deal of expense if Tacan became a civil aid, for little gain, and lower reliability.

FROM THE CLUBS

TWO THOUSAND people gathered to watch the annual rally of the Lusaka Flying Club, which was opened by the Governor of Northern Rhodesia, Sir Arthur Benson. His Excellency recalled that he had been secretary of the Club shortly after it started in 1939 and had organized the first rally, held in that year.

Twelve visiting aircraft from different parts of the Rhodesias came to this year's rally and, after the Governor's address, took part in a fly-past with the club's Piper Cub and Piper Cruiser and six aircraft owned by members. These were an Auster, Aeronca, Tiger Moth, Cessna 120, Fairchild and a Globe Swift. Later, five Vampires, a Provost and a Dakota of the R.R.A.F. gave a display.

Lusaka Rally: Sir Arthur Benson and an R.R.A.F. pilot. (See above.)

Mr. John Fox of Bulawayo, in his Auster, won the spot landing competition and also the tankard given by the Association of Flying Clubs in Central Africa for the best performance by a pilot with under 200 hours' flying experience. Other prizewinners were John Bell of the Marlborough Flying Club (bombing competition), "Rusty" Russell of the Lusaka Flying Club (best student pilot), and a 60-year-old farmer from Umtali, Mr. Perrem, who won the arrival prize in the Tri-Pacer with which he and his wife have made three trips from Central Africa to England. Mr. "Robbie" Roberts, secretary to the A.F.C.C.A., kept rally spectators amused with his antics in a Tiger Moth.

THE Lancashire Aero Club is to make an addition to its permanent staff at Barton. Mr. A. A. Rolls has been appointed a full-time flying instructor and starts his duties later this month.

NEXT Sunday, July 1, Hampshire Aeroplane Club will hold a breakfast patrol. Defending aircraft [illegible] patrol within a three-mile radius of Southampton Airport; [illegible]ers" must arrive between 8.30 and 9 a.m. at between 1,000 and 2,000ft. The officials ask club secretaries to let them know how many will be dropping in for breakfast, and remind visitors that, as landing is by prior permission only, they should telephone Eastleigh 2341 and bring their landing cards.

WILTSHIRE School of Flying has recently parted company with a faithful servant, Auster Autocrat G-AGVP with which they recommenced operations in March 1946. During this ten-year period the Autocrat flew 5,000 hours, which the club think may be a record. G-AGVP was sold "into private service" exactly ten years to the day after it came to Thruxton, at a figure 25 per cent higher than the purchase price.

THE AERONAUTICAL BOOKSHELF

"The Proving Flight," by David Beaty. Martin Secker and Warburg, Ltd., 7 John Street, London, W.C.1. Price 14s.

THE author of this book was a B.O.A.C. pilot who had made some 160 north- and mid-Atlantic crossings before leaving the Corporation in 1953. He quite obviously knows his facts (except that he consistently spells Idlewild wrongly) when dealing with the technicalities of flying a large airliner, and he can make these technicalities interesting and easily understandable to the layman. He takes some liberties with syntax and tends to attribute animate qualities to inanimate objects. But the whole adds up to an absorbing story of a new airliner's east-west Atlantic proving flight, and there are some genuinely exciting moments. The characters come to life, and the author has a happy flair for description; sky and sea, night flying and the tenseness of difficult weather conditions—all are vivid and colourful.

"Aircraft Year Book, 1955," edited by Fred Hamlin and Eleanor Thayer Miller. Lincoln Press, Inc., 1143 National Press Building, Washington 4, D.C., U.S.A. Illustrated. $6.00.

"SCIENCE led aviation literally out of this world in 1955. Top story of the year was the announcement by President Eisenhower that plans had been approved to launch a small, unmanned, earth-circling satellite. Anti-gravitation studies were launched by Martin and Convair, and widespread research went forward toward overcoming the thermal barrier by use of cermets —part metal and part non-metal—super-alloys and titanium."

Earth satellites we can understand; but anti-gravitational studies —expanded in a later reference to "anti-gravity devices based on electromagnetic field physics"—have been the most illogical standby of second-rate science fiction writers for so long that to find them included as serious research projects in this new edition of the U.S. Aircraft Industries Association's *Year Book* is a little disconcerting. Here, indeed, is promise of an end to runway problems and of power that will remove the term "escape velocity" from the space-man's dictionary. Yet *Aircraft Year Book* is no crystal ball, but a serious and invaluable volume of 479 pages, packed with hard facts and figures concerning every aspect of U.S. aviation.

If you want to know the average hourly earnings of workers in the U.S. aircraft industry over the past three years, the number of amphibians built each year since 1937, the number of civil aircraft registered in Oklahoma or the number of miles per day flown by 25 Martin 2-0-2s in service with U.S. airlines, the answers are all here. Many figures are impressive. With 750,000 employees, U.S. aviation is second only to the automobile industry in size. It turned out 3,242 civil aircraft in the first eight months of 1955 to swell the total number of civil-registered American aircraft to the incredible total of 92,067, of which 22,000 are "business planes" and 200 are helicopters used mainly for patrol and survey work.

No matter how thoroughly one absorbs the aviation news, *Aircraft Year Book* comes along each spring with a host of surprises—and this goes for the illustrations as well as the text. A picture of a "rocket propelled research test model fired at supersonic speed over Atlantic Ocean" shows a straight-winged intercepter-like aircraft, with area rule body and wing-mounted engines, that looks far from hypothetical. Even historically-minded readers are catered for, with rare views of the Le Pere biplane which set up a 1920 altitude record, the Consolidated PT-1 trainer which replaced the "Jenny" in 1926, and the Barling bomber.

Here, in fact, is the answer to every question but one—do the scientists working on anti-gravity devices tie themselves to the floor as protection against sudden success?

"The Viking Rocket Story," by Milton W. Rosen. Faber and Faber, Ltd., 24 Russell Square, London, W.C.1. Illustrated. Price 21s.

FIRST published in the United States a year ago and now appearing in this British edition, Mr. Rosen's book gives a remarkably detailed account of the programme which his upper-atmosphere research group has been carrying through since early 1946, first with ex-German V-2 rockets and then with the Viking series made by Glenn Martin and engined by Reaction Motors.

Mr. Rosen is well qualified to tell the story. A member of the U.S. Naval Research Laboratory's staff since 1940, and a director of the American Rocket Society, he was chairman of the Society's committee which first proposed Project Vanguard—the forthcoming earth-satellite experiment; he is now technical director of that project.

In his book he has succeeded admirably in reconciling all those literary qualities—historical and technical detail, character-drawing, descriptions of dramatic incidents—which in the hands of so many writers are mutually destructive of one another. There is no acknowledgement of collaboration in the work, and if the writing is, in fact, Mr. Rosen's own, he has very nearly mistaken his vocation.

Though the tense atmosphere of the various firings—the unspoken feeling that disaster is hovering just around the corner—is never allowed to obtrude on the objective narrative, it is inevitably this that makes the greatest impact on the reader. There was, for instance, Viking 10, which had suffered rather more than the usual share of pre-launching snags. At last all was ready for the count—down:—

"'Seven, six, five, four, three, two, one, zero!'

"Hardin pushed the firing switch, the plug dropped from the rocket's nose, and the turbine exhaust belched forth a stream of ominous black smoke. Suddenly, without warning, in less than a second, a terrific blast smote the blockhouse as the rocket's tail seemed to disintegrate. White steam, orange flames and gleaming metal shot out from the tail in an explosion of unbelievable violence. Then a great ball of flame rose from the tail and enveloped the rocket.

"'Misfire! The rocket's on fire! No shoot, the rocket is burning.'

"When he saw the explosion, Hardin, without hesitation, threw the firing switch to cut-off. Schlechter ordered the carbon dioxide and all water sprays on. Then he turned to Pitts and said, 'The rocket is out of our control. It belongs to the firemen now.'

"The four giant fog nozzles at the edge of the launching mat, each one pointed at the base of the rocket, were turned on. The water came out with agonizing slowness, trickling toward the flaming rocket. When, finally, the full force of the spray hit the tail, a great cloud of steam obliterated the area."

But half an hour later, though the 42ft missile stood whole in its launching gantry, a small fire still burned at its base; and in the tanks above were nearly 6,000 lb of liquid oxygen, over 5,000 lb of alcohol and, to drive the turbine to pump this fuel to the 20,990 lb-thrust motor, nearly 400 lb of hydrogen peroxide.

Two courageous men left the blockhouse and, taking a hose right up to the fire, at last extinguished it. Then it was noticed that the alcohol leak which had been feeding the fire in the tail was slowly draining the tank and causing its thin skin to wrinkle, for the electrically controlled valves were inoperative. A few minutes more and the tank would collapse altogether, showering two tons of alcohol over the still red-hot motor.

It was decided to shoot a hole in it:—

". . . but Joe had anticipated us and we met him coming out with a carbine slung over his shoulder.

"'All personnel clear the launching area. Retreat to the blockhouse,' the warning came over the loud-speakers.

"One-forty. Pitts, Smith, Schlechter and I were huddled behind a concrete barricade fifty yards south-west of the rocket. Smith defined a point eight inches below the top of the tank where he wanted the bullet placed. Pitts rested the gun barrel on a slit in the barricade, took careful aim, and fired. A small black hole appeared high on the side of the rocket exactly where Smith had wanted it. Suddenly, the bottom half of the tank became smooth, and a few moments later the upper half sprung out. A great cheer went up from the blockhouse—the tank had been saved."

And so Viking No. 10, too, was saved, to be repaired and eventually fired to an altitude of 136 miles.

Fifty-odd fine photographs and some useful diagrams illustrate Mr. Rosen's book.

OTHER BOOKS RECEIVED

Measurement of Responsibility, by Elliott Jaques. Tavistock Publications, Ltd., 2, Beaumont Street, London, W.1. Price 15s.

Tables of Weber Parabolic Cylinder Functions, computed by Scientific Computing Service, Ltd. H.M. Stationery Office, York House, Kingsway, London, W.C.2. Price £3 3s.

Géographie de la Circulation Aérienne, by Eugène Pépin. Gallimard, 5, rue Sebastien-Bottin, Paris VIIIe.

Let's Learn to Fly, by Arnold Warren. Sir Isaac Pitman and Sons, Ltd., 39 Parker Street, London, W.C.2. Price 18s.

Rockets and Guided Missiles, by John Humphries, B.Sc., A.M.I.Mech.E., A.F.R.Ae.S. Ernest Benn, Ltd., Bouverie House, Fleet Street, London, E.C.4. Price 30s.

Aviation Directory of Canada, published by *Aircraft* Magazine, 341, Church Street, Toronto 2, Ontario, Canada Price $5.0.

Dark Haven, by F. T. K. Bullmore. Jonathan Cape, 30 Bedford Square, London, W.C.2. Price 15s.

Born to Fly, by Georges Blond. Souvenir Press, Ltd., 81 Peters Court, London, W.2. Price 16s.

Theory of Combustion Instability in Liquid Propellant Rocket Motors, by Luigi Crocco and Sin-I Cheng. Butterworth Scientific Publications, 88 Kingsway, London, W.C.2. Price 37s 6d (in U.S.A. $5.25).

Fighter Pilot, by W/C. Paul Richey, D.F.C. Hutchinson and Co. (Publishers), Ltd., 178-202, Great Portland Street, London, W.1. Price 10s 6d.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

Helicopters for Escort

AN experiment to test the feasibility of operating helicopters from escort vessels will be undertaken by the Royal Canadian Navy this summer. Approval has been given for the installation of a helicopter platform on the frigate H.M.C.S. *Buckingham*, based at Halifax. Work on the installation is expected to be completed during July, and trials with helicopter landings and take-offs will begin immediately thereafter. These trials will be conducted in various weather and sea conditions.

Canada's Defence

A DEBATE on defence policy was opened in the Canadian House of Commons on June 20, with the Minister of Defence tabling a White Paper on the matter. This document showed the Government's concern with improving Canada's air-defence system through increasing the strength of the R.C.A.F. The White Paper said that a year ago the manpower ceiling was raised by 1,000 to 51,000 at the expense of the Army, and emphasized the urgent need for a jet intercepter—the CF-105—to replace the CF-100. The Department noted that the CF-105 prototype, together with Canada's guided-missile programme, would cost some $23 million. This year's cost of the Mid-Canada Early-Warning Line (see pages 844-845 of this issue) would be $100 million, compared with $45 million last year. The Defence Department was now in the process of reorganizing the auxiliary squadrons of the R.C.A.F. and wished to replace Sabres now equipping the R.C.A.F. squadrons in France and Germany with jet fighters of longer range (presumably CF-100s). The first of these would leave Canada before the end of the year.

Freedom of Southport

FREEDOM of Entry into the County Borough of Southport was conferred on June 16 upon No. 2611 (West Lancashire) Field Squadron, R.Aux.A.F. Regiment. Cold and miserable conditions did not prevent a crowd from gathering to witness the ceremony. Led by the band of the R.A.F. Regiment (musical director, F/L. H. J. L. Cash), the men of the Regiment marched to the forecourt of the pier, which served as a parade ground; there they formed up in front of the dais to await the arrival of the Mayor and Mayoress of Southport, Councillor and Mrs. F. E. Thornley, with officers and other officials. The Queen's Colour of the Regiment was marched at the head.

After reading the title deed, the Mayor presented it, in a silver container, to the commanding officer, S/L. A. R. Poole, D.S.O., D.F.C., who handed it to the scroll-bearer for trooping in front of the parade. Having trooped the scroll, the C.O. took up position at the head of the parade for a salute to the burgesses of Southport, and, on the second, Meteors of No. 611 (West Lancashire) Squadron, R.Aux.A.F., passed overhead. The Mayor, with A.V-M. B. C. Yarde, C.V.O., C.B.E., Air Officer Commanding No. 63 Group, took the salute.

The Mayor of Southport, Councillor F. E. Thornley, reads the title deed conferring the Freedom of Southport upon No. 2611 (West Lancashire) Field Squadron, R.Aux.A.F. Regiment, as described on this page. Also in the picture are (centre) A.V-M. B. C. Yarde, C.V.O., C.B.E., and S/L. A. R. Poole, D.S.O., D.F.C., officer commanding No. 2611 Squadron.

Helicopter Airlift

THE Helicopter Force in Cyprus has been increased. A small number of R.A.F. Bristol Sycamore helicopters for reconnaissance and liaison duties, and a R.A.F. Whirlwind for trials in a troop-carrying role have been air-lifted to the island during recent days by Blackburn Beverleys of Transport Command. The additional helicopters are being used against the E.O.K.A. terrorists. They were flown to Nicosia in Beverleys of No. 47 Squadron (S/L. D. P. Boulnois), with an intermediate stop at Luqa (Malta). The first Beverley, which carried two Sycamores, left R.A.F. Abingdon, Berks, on June 8 and arrived at Nicosia on June 12. This aircraft, piloted by F/Ls. H. Baker and J. M. Earland, was delayed at Luqa by minor mechanical trouble. Another Beverley, piloted by F/Ls. E. Sleeman and H. W. Guile, carrying one Sycamore, left on June 12, arriving at Nicosia on June 13. The third Beverley, piloted by S/L. D. P. Boulnois and F/O. D. Owen, carried the Whirlwind. It left Abingdon on June 16 and arrived at Nicosia on June 17.

Royal Air Force Appointments

THE following continues a list of Royal Air Force appointments recently announced by the Air Ministry:—

S/L. F. G. Abbott to R.A.F. Ternhill, for technical duties (with acting rank of wing commander); S/L. E. H. King to Air Ministry, for duty in the Department of the Chief of the Air Staff (with acting rank of wing commander); S/L. J. B. Lewis to R.A.F. Yatesbury, for administrative duties (with acting rank of wing commander); S/L. C. W. Lovatt to Headquarters, Fighter Command, for administrative staff duties (with acting rank of wing commander); S/L. E. K. Paine to the Joint Anti-Submarine School, to instruct (with acting rank of wing commander); S/L. C. G. Reeve, M.B.E., to R.A.F. South Cerney, for administrative duties (with acting rank of wing commander); S/L. D. C. Saunders, A.F.C., to R.A.F. Ternhill, for administrative duties (with acting rank of wing commander); S/L. W. A. Cormack, M.B.E., to Air Ministry, for duty in the Department of the Chief of Air Staff (with acting rank of wing commander); S/L. E. F. Thornicroft, A.F.C., D.F.M., to Headquarters, Middle East Air Force (with acting rank of wing commander); S/L. J. M. Ayshford, D.F.C., to Air Ministry, for duty in the Department of the Chief of Air Staff (with the acting rank of wing commander); S/L. T. Knight to Air Ministry, for duty in the Department of the Chief of Air Staff (with acting rank of wing commander); S/L. W. H. McCulloch to Headquarters, Bomber Command, for administrative staff duties (with acting rank of wing commander); S/L. G. F. McMahon, D.F.M., to Headquarters, Middle East Air Force, for administrative staff duties (with acting rank of wing commander); S/L. K. F. Massey to R.A.F. Hucknall, for administrative duties (with acting rank of wing commander); S/L. A. D. Rutherford-Jones to No. 21 Maintenance Unit, to command (with acting rank of wing commander); S/L. W. A. M. Oram to Air Ministry, for duty in the Department of the Air Member for Personnel (with the acting rank of wing commander); S/L. H. Harvey to Headquarters, Bomber Command, for technical staff duties (with the acting rank of wing commander); S/L. J. C. Cogill, D.S.O., D.F.C., to R.A.F. Coltishall, for flying duties (with the acting rank of wing commander); S/L. B. Champneys, D.F.C., to R.A.F. Leconfield, for flying duties (with the acting rank of wing commander); S/L. W. C. Horder to the Central Signals Establishment, for technical duties (with the acting rank of wing commander); S/L. F. T. Bolt to R.A.F. Swinderby, for technical duties (with the acting rank of wing commander); S/L. R. M. W. Henderson to R.A.F. Hartlebury, for administrative duties (with the acting rank of wing commander); S/L. M. F. Hobden to No. 4 (Light Anti-Aircraft) Wing, to command (with acting rank of wing commander); S/L. J. F. J. Dewhurst, D.F.C., A.F.C., to Air Ministry for duty in the Department of the Air Member for Supply and Organization (with the acting rank of wing commander); S/L. H. Durkin to the R.A.F. Technical College (Debden Division), for technical duties (with the acting rank of wing commander); S/L. T. W. James, to Headquarters, No. 40 Group, for administrative staff duties (with the acting rank of wing commander); S/L. D. S. Sanderson to R.A.F. Handforth, for administrative duties (with the acting rank of wing commander).

"Flight" photograph

Dr. Muhayiddin Fikini and his aides, representing the Libyan Prime Minister at Biggin Hill last Friday, joined a No. 46 Sqn. crew on the plateau of their Javelin and contemplated the cockpit arrangements. Access to this belvedere is via steps in the port side of the tail.

SERVICE AVIATION . . .

Libyan Visitor at Biggin

THE Prime Minister of Libya was represented during a visit to R.A.F. Biggin Hill last Friday by Dr. Muhayiddin Fikini. A Valiant, a Javelin from No. 46 Sqn., a Jet Provost, a Canberra and Hunters were lined up for inspection, and Dr. Fikini visited the St. George's Chapel of Remembrance and toured the station. He was welcomed by Air Marshal H. L. Patch, A.O.C-in-C. Fighter Command, A.V-M. V. S. Bowling, A.O.C. No. 11 Group, and G/C. J. Barraclough, Station Commander at Biggin Hill.

Demonstrations were given by the Valiant and a Canberra and by the No. 11 Group aerobatic team of Hunters.

R.A.F.S.A.A. Championships

THE 30th annual championship meeting of the Royal Air Force Small Arms Association, held at Bisley last week, will be remembered as "Willott's meeting." At the age of 51, S/L. C. C. Willott is retiring from the Service this year and it is gratifying that he should win—for the eighth time— the R.A.F. Rifle Championship and, for the first time, the Queen's Medal which was instituted in 1953.

His first win was in 1926 as an L.A/C., and his next in 1930 as a corporal. He performed the hat trick for the first time by becoming champion in 1931 and 1932.

In 1947, 1948 and 1949 as a squadron leader he scored a hat trick, and in his final win last week his score of 349 was the highest in all his successful attempts. In fact his score has been beaten only twice since the contest was instituted in 1921.

Although his score was high it was not a runaway win. Sgt. Lane-Joynt came second with a total of 343 and F/O. Christie third with 342. Incidentally Sgt. Lane-Joynt won the championship in 1952 with the record score of 356.

The contest between the Commands for the Rothermere Shield was as keen as ever and Fighter Command, the winners, were fortunate in having from West Malling alone no fewer than three previous champions as representatives. These were the redoubtable S/L. Willott, Sgt. Lane-Joynt and S/Tech. Creasey.

This year, for the first time, there were 22 representatives from No. 1 Air Division of the R.C.A.F. Having seen how things are, and experienced a Bisley meeting, it is their intention to return next year in winning form.

A feature of last week's contests was the large number of entries for the various sub-machine-gun items. Shooting was very keen, but the conditions allowing "only those sub-machine-guns which are issued to and on the charge of his station may be used by any competitor" helped those who were fortunate enough to possess new Sterlings—as against some very old Stens which were in evidence.

Results of the main contests were:—

Queen's Medal: 1st, S/L. Willott, 349; 2nd, Sgt. Lane-Joynt, 343; 3rd, F/O. Christie, 342. *Tyro Championship (SRa):* 1st, C/Tech. Tucker,119; 2nd, F/Sgt. Fogarty, 117. *Rothermere Shield:* 1st, Fighter Command, 6,086; 2nd, Home Command, 5,977; 3rd, 2nd T.A.F., 5,836. *Command Rifle Match (SRa):* 1st, Fighter Command, 1,333; 2nd, Home Command, 1,304. *Station Rifle Match (SRa):* 1st, West Malling, 1,299 (record score); 2nd, Waterbeach, 1198. *Squadron Rifle Match (SRa):* 1st, No. 5131 B.D. Sqn., 632; 2nd, No. 54 Squadron, 606. *Combat Snapshooting Match (SRa):* 1st, Wyton, 63.7 sec.; 2nd, Waterbeach (A), 71.5 sec.

Apprentices and Boy Entrants Match (SRa): 1st, No. 2 Squadron, No. 3 Wing, Halton, 353; 2nd, Hereford, 339. *Rifle XX Match (SRb):* 1st, Sgt. Richards, 140; 2nd, S.A/C. Langdon, 139; 3rd, Cpl. Kelman, 139. *W.R.A.F. Rifle Championship (SRb):* 1st, Sq/O. Collins, Home Command, 138; 2nd, P/O. Smith, Hereford, 135. *Command Rifle Match (SRb):* 1st, Flying Training Command, 1,086; 2nd, Bomber Command, 1,085. *Station Rifle Match (SRb):* 1st, White Waltham, 537; 2nd, Winthorpe, 532. *Old Comrades (SRb):* 1st, S/L. Laceby Stevens, 136; 2nd, W/C. Edmundes, 133. *R.Aux.A.F. and R.A.F.V.R. Cup (SRb):* 1st, P/O. Russell, U.L.A.S., 136; 2nd, P/O. Horlock, B.U.A.S., 130. *University Air Squadrons Match (SRb):* 1st, Bristol, 754.

R.A.F. Revolver Championships: 1st, F/L. Steele, 190; 2nd, S/L. Willott, 185; 3rd, S/Tech. Creasey, 184. *Command Revolver Match:* 1st, Fighter Command, 666; 2nd, Flying Training Command, 633. *Station Revolver Match:* 1st, West Malling, 339; 2nd, White Waltham, 323. *Squadron Revolver Match:* 1st No. 153 Squadron, 211; 2nd, No. 661 Squadron, 207. *R.A.F. Sub-machine-gun Championship:* 1st, W/O. Novis, 156; 2nd, F/O. Fitch, 144. *Command Sub-machine-gun Match:* 1st, Home Command, 969; 2nd, Tech. Training Command, 967. *Station Sub-machine-gun Match:* 1st, Wahn, 968; 2nd, Waterbeach, 963. *Light-machine-gun Match:* 1st, Linton-on-Ouse, 140; 2nd, Biggin Hill, 139; 3rd, Halton, 134. *Small Arms Efficiency Cup:* F/L. Steele, 536; 2nd, S/L. Willottt, 535; 3rd, F/O. Fitch, 519.

For "Not" Read "Now"

IN last week's report of the Manby reunion dinner, references (in A.Cdre. Walker's speech) to the shorter course should have read: ". . . a jet green instrument rating was *now* mandatory before reaching Manby"; and "Although the overseas flights were *now* 'out,' special flights still went on regularly."

S/L. C. C. Willott is borne off (left) after winning the R.A.F. rifle championship (for the eighth time) at the R.A.F.S.A.A. meeting described on this page. S/L. Collins signals anxiously to the W.R.A.F. band for appropriate music. (Right) The scene at the butts on the last day during rapid firing at 800 yd range.

"Flight" photographs

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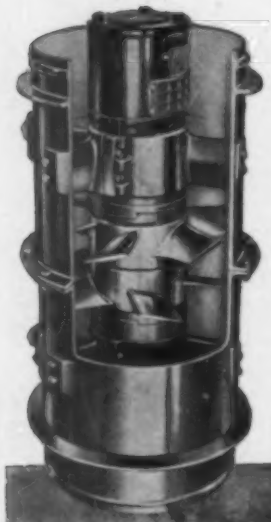

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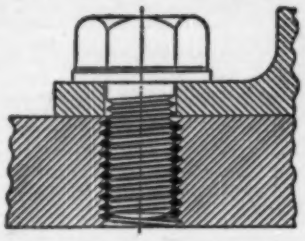

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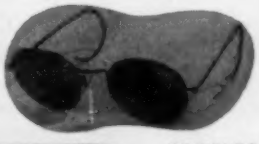

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HESTON AIRPORT
Hounslow, Middlesex

have immediate openings in their

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on a new and interesting Civil Aeroplane for:

SENIOR, INTERMEDIATE and JUNIOR DRAUGHTSMEN, EXPERIENCED STRESSMEN, LOFTSMEN

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GENTLEMAN, 26, of intellect and character, knowledge electronics, would invest himself and £4,000 in small enterprising project connected aviation. Box No. 2712. [5443

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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

FROM Eagle Aviation, Ltd., of Marble Arch House, 32-50, Edgware Road, London, W.2:—

APPLICATION No. 798. For a Seasonal Inclusive Tour Service with Viking and Dakota aircraft in conjunction with Sir Henry Lunn, Ltd., for the carriage of passengers and supplementary freight between London (Blackbushe) and Rimini at a frequency of up to seven return flights weekly during the season from May to October inclusive each year, for a period of seven years, commencing May 1, 1957.

APPLICATION No. 373/3. For an ammendment to the terms of approval of the Normal Scheduled Service which they are authorised to operate during the period up to October 31, 1961, on the route London (Blackbushe)-Luxembourg and/or Innsbruck, so as to permit the company to operate on the sector London (Blackbushe)-Luxembourg at an increased frequency of 10 return flights daily throughout the year for the remaining period of approval.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objection with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3, Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [5437

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NIGHT Flying, instrument flying, commercial pilot licences. Approved M.C.T.A. private pilot's course.

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A.F.R.Ae.S., A.R.B. Certs., A.M.I.Mech.E., etc., on "no pass, no fee" terms. Over 95 per cent successes. For details of exams and courses in all branches of aeronautical work, navigation, mechanical eng., etc. Write for 144-page handbook free.—B.I.E.T. (Dept. 702), 10 Wright's Lane, London, W.8. [0707

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TECHNICIANS

having the undermentioned qualifications, for work on

GUIDED WEAPONS

AT

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STRUCTURAL AND MECHANICAL TEST

1. **TESTWORK**—must be experienced in this class of work, and hold Higher National Certificate or Engineering Degree.
2. **STRUCTURES DEVELOPMENT**—must have experience of test work, and be a qualified Structural Engineer holding Higher National Certificate or Engineering Degree.
3. **KINETIC HEATING**—Physicist or Mechanical Engineer with Ph.D. degree for development of test equipment for kinetic heating tests.
4. **KINETIC HEATING**—as above, but holding B.Sc.
5. **LABORATORY INSTRUMENTATION**—experience in instrumentation for structural test work, holding Higher National Certificate.
6. Junior to above, to work on laboratory instrumentation.

STRUCTURES ANALYSIS

7. **AEROELASTICIANS**—experienced men required, holding B.Sc. degree.
8. **STRESSMEN**—experienced men required, holding Higher National Certificate as a minimum qualification.
9. **PROJECT STRESS AND THERMOELASTICITY**—Senior Stressmen required, holding Higher National Certificate as a minimum qualification.
10. **WEIGHT CONTROL ENGINEERS**—experienced men required, holding Higher National Certificate.

DRAWING OFFICE

11. **DESIGN DRAUGHTSMEN**—various grades, all with minimum Ordinary National Certificate qualifications.
12. **TRACERS**—experienced tracers required.
13. **TECHNICAL PUBLICATIONS**—experienced Technical Authors and Artists required.

Working conditions are exceptional and good salaries will be paid to suitably qualified people.

Applications, which will be treated in strict confidence are invited from personnel who consider that they can fill any of these vacancies, and should be addressed to the **PERSONNEL MANAGER, A. V. ROE & CO., LIMITED, GREENGATE, MIDDLETON, MANCHESTER,** quoting ref. WRD/Tech/R86 giving details of experience, qualifications, present salary and salary required.

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ALL subjects for professional pilot or navigator licences and ratings embracing Academic, Technical, Simulated and Flying aspects. Full-time personal coaching, also short periods. Home-study excellent alternative.

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FLYING BASE: CROYDON AIRPORT. [0277

FREE: Brochure giving details of courses in all branches aero eng., covering A.F.R.Ae.S., M.C.A. exams, etc. Also courses for all other branches of engineering.—Write: E.M.I. Institutes, Dept. F.26, London, W.4. (Associated with H.M.V.) [0964

LEARN to fly, £26; Instructors' Licences and Instrument flying for £3/5/- per hour. Night Flying £4/5/- per hour. Residence 6 guineas weekly. Approved M.C.A. Private Pilot's Licence course. Specialised course for Junior Commercial Pilot's Licence.—Wiltshire School of Flying, Ltd., Thruxton Aerodrome (Andover Junction 1 hour 15 minutes from Waterloo), Hants. [0253

SITUATIONS VACANT

THE UNIVERSITY OF SOUTHAMPTON

APPLICATIONS are invited for the Shell B.P. Research Fellowship in the Department of Aeronautical Engineering. Salary £800 per annum with additional amount available for equipment and travel. Tenure three years. Wide range of research subjects. Further particulars should be obtained from the Secretary and Registrar, to whom application (6 copies) giving age, full details of qualifications and experience and the names of three referees should be sent within two weeks of the appearance of this advertisement. [5419

The . . .
British Air Line Pilots Association
95 MOUNT STREET, W.1
Tel.: GROsvenor 6261

Membership open to all Commercial and Service Pilots. For full details concerning objects and particulars of Membership please write to Secretary.

FERRANTI LIMITED
EDINBURGH
have a vacancy for a
STAFF PILOT
with A.L.T.P. or Senior Commercial licence.

Dove endorsement an advantage. Command time, minimum 3,000 hours. Standard airline rates are applicable and the post is permanent and superannuated. Preference will be given to professional pilots under the age of 35.

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SITUATIONS VACANT

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Present and long term future commitments necessitate considerable increase in our Technical Staff. Staff is required in the following departments:

DRAWING OFFICE

STRESS OFFICE

AERODYNAMICS

MATHEMATICAL
(computing)

FLIGHT TEST

WIND TUNNEL

TEST LABORATORIES
(Mechanical and Electronic)

These jobs are permanent for suitable people and offer every opportunity for advancement. Working conditions and rates of pay are excellent.
Write to:

The Chief Designer,
Blackburn & General Aircraft, Ltd.,
Brough, E. Yorks.

Please state if you prefer our Brough, London or Leeds Design Offices. [5292

AIR TRAFFIC CONTROLLER

FERRANTI, LIMITED, Edinburgh, have two vacancies for Air Traffic Controllers with A.C.R. experience. Additional qualifications will be: (a) Experience on a joint-user airfield, (b) Experience as a pilot or navigator, (c) The possession of a university degree. It will be necessary for the successful applicants to obtain an M.T.C.A. certificate of competence, if they do not already hold this. A salary appropriate to responsibility involved will be offered. Applicants are invited to write, giving details of their careers to date, to the Personnel Officer, Ferranti Limited, Ferry Road, Edinburgh, 5, quoting Ref. ATC/TID/29. [5386

SITUATIONS VACANT

MINISTRY OF EDUCATION:

Museum Assistants, Science Museum

THE Civil Service Commissioners invite applications for four posts in the Science Museum and eight posts in the Science Library. Age at least 16 on 1st April, 1956. Candidates should normally have School Certificate or General Certificate of Education or Scottish Leaving Certificate, or equivalent, with qualification in mathematics or a science subject for the Museum posts or a modern foreign language for the Library posts. Appointment may be to the unestablished grade with, normally, establishment after not more than two years, or direct to an established post in certain cases.

Salary:—
Unestablished—£256 (age 16) to £549 (men) or £502 (women).
Established—£302 (age 18) to £611 (men) or £528 (women).

STARTING salary according to age, up to £449 (men) or £407 (women) at age 25 or over, but higher starting pay may be granted exceptionally to candidates over 25.

WOMEN'S salaries being improved under equal pay scheme.

PAY and conditions of service are under review.

APPLICATION forms from Secretary, Civil Service Commission, 6, Burlington Gardens, London, W.1, quoting No. 143/56/10, should be returned by 12th July, 1956. [5428

THE SUPERMARINE WORKS OF VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED

OUR Flight Test Section, which is situated at Wisley Airfield in Surrey, have vacancies for aeronautical engineers to deal with the flight testing of new fighter aircraft. Applicants should have a degree or H.N.C. in aeronautical engineering; some experience in similar work or aerodynamics would be an advantage, but is not essential.

THERE are also vacancies for male or female junior technicians who should have some engineering or scientific training.

APPLY to the Personnel Manager, Vickers-Armstrongs (Aircraft) Limited, Supermarine Works, Hursley Park, nr. Winchester. [5400

GUIDED MISSILES

A Senior Engineer is required by an important Company, engaged on major guided missile projects, to take charge of work associated with the flight trials of these weapons.

The main responsibilities of this post are to co-ordinate the work of a large group of technicians engaged on this task; the work is of a very interesting and varied character, and covers overall system testing and the analysis and the behaviour of installations covering mechanical, hydraulic, electronic and electrical engineering.

A University Degree or its equivalent is required in one of the following branches of engineering:—

Servo-control systems, Electronic and Electrical Engineering, Radar, radio and telecommunications.

The salary scale will be commensurate with the high degree of responsibility associated with this Senior post, and the successful applicant will be eligible for the Company's attractive Superannuation Scheme.

All replies should be addressed to:—

Box No. 2170, c/o "Flight," quoting Reference L/3.

STRESSMEN

A number of Stressmen are required for interesting work in the Guided Weapons Division of Sir W. G. Armstrong Whitworth Aircraft Ltd.

The minimum qualifications are H.N.C. in Mechanical, Aircraft or Structural Engineering, together with at least two years' experience in the stress office of an Aircraft or Guided Weapons organisation.

Pleasant working conditions and amenities are provided and an attractive superannuation scheme is in operation. The work is of a permanent character in a new and expanding field, and the salaries are good.

All replies should be addressed to:—

Technical Appointments Officer,
SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT LTD.,
BAGINTON, NR. COVENTRY, quoting Reference St/5/ARM/TAO.

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED

WEYBRIDGE, SURREY

have vacancies on After Sales Service for:

(t) AIRCRAFT SERVICING ENGINEERS (Airframe) with 'A' licences, preferably endorsed for Viking or four-engined aircraft; for representatives work on Viscount aircraft overseas, after gaining the necessary experience at Weybridge.

(u) AIRCRAFT SERVICING ENGINEERS (Electrical)—an 'X' licence is preferable, but not essential, for representatives work on Viscount aircraft overseas, after gaining the necessary experience at Weybridge.

(v) TECHNICAL LIAISON ENGINEERS (Airframe and Electrical) in the Civil Aircraft Service Department. Applicants should be well educated, including an apprenticeship or similar training, and have had some experience on aircraft design.

Applications, quoting date and prefix letter of advertisement, to:

Employment Manager,
Vickers-Armstrongs (Aircraft) Ltd.,
Weybridge, Surrey.

Holidays already arranged by applicants for this year taken into account.

AUSTRALIA

Vacancies exist in the

GUIDED WEAPONS DIVISION
of
SIR W. G. ARMSTRONG
WHITWORTH AIRCRAFT LIMITED
for
Mechanical and Electrical Engineers

Applicants should possess a degree in Mechanical or Electrical Engineering, or H.N.C., with a minimum of two years' experience in this type of work.

There are opportunities for advancement in this rapidly expanding field and attractive salaries are offered to successful candidates. In addition, a generous pension scheme is in operation.

The Division is located in Southern Australia and passages will be provided for applicants and their families, together with every assistance in obtaining housing upon arrival in Australia.

All replies should be addressed to:

Technical Appointments Officer,
Sir W. G. Armstrong Whitworth Aircraft Ltd.,
Baginton, Coventry.
Quoting Reference AUS/5

SITUATIONS VACANT

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Drawing Office Staff

THE rapid expansion of our Aircraft Accessories Division has given rise to the following vacancies for work on the Britannia and other famous aircraft:—

(a) SENIOR DESIGNERS experienced in light mechanical engineering, including electro-mechanical engineering, capable of basic thought and leading a design development team.
(b) DESIGN DRAUGHTSMEN capable of developing basic designs for production.
(c) DESIGN DRAUGHTSMEN with experience in the mechanical aspects of chassis layout and mechanical devices for M.O.S. test equipment.
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Good salaries will be offered.
Pensions and insurance scheme.
First class working conditions and facilities.

SATURDAY MORNING INTERVIEWS ARRANGED

PLEASE write or telephone (ACO 3434), The Personnel Manager. [5421

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Offers Ideal Careers for Pilots

Not over 25 years of age, on leaving the R.A.F. or Fleet Air Arm. (Experienced pilots with licence qualifications will be considered up to age 30.)

SALARIES from £1,100 to £3,430 p.a. when qualified.

GENEROUS allowances.

EXCELLENT pension.

NO compulsory retirement age from flying.

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PILOTS of good education and personal qualities having at least 150 hours flying experience as pilot-in-charge of any type of aircraft should write to Chief Personnel Officer, B.O.A.C., London Airport, sending stamped, addressed envelope, for application form. [5377

RADIO OPERATOR/TECHNICIAN

THERE is a vacancy at Woodford Aerodrome, Cheshire, for a Radio Operator for Aircrew duties on Flight Test Work. Applicants should possess a current P.M.G. Radio Operator's Licence and should be capable of working on the installation of the various types of radio and radar equipment fitted in the present-day aircraft. Applications giving full particulars of previous experience, age, etc., should be addressed to the Personnel Manager, A. V. Roe & Co., Ltd., Greengate, Middleton, Manchester. [5338

INDEPENDENT AIR TRAVEL LIMITED

Bournemouth (Hurn) Airport,

Christchurch, Hants.

REQUIRE Viking captains and first officers. Apply Hurn Airport, or telephone, Northbourne 700. [5436

INSPECTORS

EXPERIENCED men on complete aircraft. Apply giving full particulars to: Edgar Percival Aircraft, Ltd., Stapleford Aerodrome, Nr. Abridge, Essex, or telephone, Theydon Bois 2321. [5442

WANTED. Licensed Chief Inspector. Experienced Dakota and ancillaries. House available. Surrey. Box 2114. [0977

COMMERCIAL Pilot with Auster endorsement wanted for summer season (mostly pleasure flying). Apply with details of flying experience to Box No. 2442. [5393

WANTED Q.F.I. for Meteors and a Staff Pilot for Venom and Attacker aircraft. Apply Chief Pilot, Airwork Limited, Royal Naval Air Station, St. Davids, Haverfordwest, Pembs. [5385

LINK Trainer Instructor required for part-time duties at evenings and weekends. Must be fully conversant with modern procedures and able to instruct to Instrument Rating standard. Apply Chief Instructor, Elstree Aerodrome, Herts. [5426

SENIOR Design Draughtsman required for small precision mechanical components, including pneumatic and hydraulic equipment. Applicants must have sound practical experience and preferably, Higher National Certificate or equivalent. Salary at least £800 p.a. according to qualifications. Factory 20 miles north of London. Travelling expenses, canteen facilities, life assurance and superannuation scheme. Box No. 2433. [5388

AIR CHARTER LIMITED

require for their long range Tudor fleet:—

(a)

FLIGHT RADIO OFFICERS

Minimum qualification M.T.C.A. temporary licence.

(b)

FLIGHT NAVIGATORS

Minimum qualification M.T.C.A. F/N's technical licence.

(c)

FLIGHT ENGINEERS

Minimum qualification F/E's basic M.T.C.A. examination for the "O" licence.

Apply by letter in first instance, giving full particulars to:—

Operations Manager,
AIR CHARTER LIMITED,
15, Great Cumberland Place, London, W.1.

A. V. ROE & CO. LTD.
have vacancies for

TECHNICIANS

for work on

GUIDED WEAPONS
at WOODFORD AERODROME, CHESHIRE
having the following experience:—

SENIOR STAFF APPOINTMENTS

1. **MECHANICAL ENGINEERS** with experience of Fuel Systems, Cooling and Heating Systems, and Power Plant Installations.
2. **STRUCTURAL ENGINEERS—** with experience of Structural and Mechanical Design. Must have had experience in charge of project.
3. **AEROELASTICIAN** to become Structures Analysis Engineer. Must have good experience.
4. **PROJECT STRESS—THERMOELASTICITY** must be an experienced Senior Stressman, preferably holding a degree. Would become Structures Analysis Engineer.

Working conditions are exceptional, good salaries will be paid to suitably qualified people. Applications, in writing, giving details of experience, qualifications, present salary and salary required to the **PERSONNEL MANAGER, A. V. ROE & CO., LTD., GREENGATE, MIDDLETON, MANCHESTER,** quoting reference WRD/Tech/R.62.

A. V. ROE & CO.
LIMITED
(AIRCRAFT CONSTRUCTORS)
GREENGATE, MIDDLETON, MANCHESTER

Have Vacancies on Super-Priority Design and Development Projects for

DESIGN DRAUGHTSMEN
(Senior and Junior)

Applications are invited from individuals having Aircraft, Mechanical, Structural or Electrical experience.

Salaries will be arranged according to experience and ability.

Applications will be treated in strict confidence and should be addressed, in the first place, quoting Ref. PM/1 to:

Personnel Manager,
A. V. Roe & Co., Limited,
Greengate, Middleton,
Manchester

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED
HURN DEPOT,
NR. BOURNEMOUTH, HANTS

have vacancies for Draughtsmen (Senior, Intermediate and Junior), Technicians and Weights Engineers on Viscount Aircraft development and new project design work covering:

Air Frames
Engine Installations
Fuel Systems
Pressure Systems
Electrical and Radio Installations
Interior Accommodations, etc.

Aircraft experience desirable but not essential.

Applications also considered from personnel who have satisfied the following conditions, to train as draughtsmen:

(a) Served an engineering or electrical apprenticeship or equivalent.

(b) Are in possession of an Ordinary National Certificate, and

(c) Are no longer liable for National Service.

Applications, quoting date of advertisement, to: **Employment Manager, Vickers-Armstrongs (Aircraft) Limited, Hurn Depot, Nr. Bournemouth, Hants.**

Holidays already arranged by applicants for this year taken into account.

SITUATIONS VACANT

AIRCRAFT section leader design draughtsman required. Salary according to age, experience and qualifications up to £900 per annum. Pension scheme/superannuation fund in operation. Write or Phone: BAYNES AIRCRAFT INTERIORS LIMITED, Langley Aerodrome, Bucks. Telephone: Langley 451. [0476

APPLICATIONS invited from senior and intermediate draughtsmen on interesting projects. Excellent prospects and remuneration with a rapidly expanding and progressive firm. Superannuation scheme and excellent canteen facilities. Apply Aero Controls Limited, Weedon Road, Northampton. [5435

WEST AFRICAN AIRWAYS CORPORATION require a Chief Engineer, on direct contract, to take charge of their Technical Department in Lagos, Nigeria. The successful applicant can look forward to a career where high integrity, initiative and drive will be fully rewarded. The candidate must meet the following requirements:—

1. Must be over 35 years of age.
2. Must have undergone a recognised engineering training, including full workshop training or apprenticeship.
3. Must hold professionally-recognised qualifications, preferably, but not necessarily, an engineering degree.
4. Must have held a managerial post in either the air transport or the aircraft industry. In addition, any of the following experience will be considered advantageous, but is not necessarily vital:—
   (1) The holding, either now or previously, of ground engineer's licences.
   (2) Membership of any of the recognised engineering or technical institutes or societies.
   (3) Direct experience in the application and operation of modern methods of production planning and control, not necessarily in the air transport industry.
   (4) Direct experience in air transport in the United Kingdom, U.S.A., Canada or Australia.
   (5) Some experience in a rapidly-developing country such as Nigeria.

THE starting salary will be £2,500, with increments up to £3,000. Free fully furnished quarters are provided and there are various allowances. There is a pension scheme in operation.

ALL applications will be treated in strict confidence and should be forwarded to the European Representative, West African Airways Corporation, 29, New Bond Street, London, W.1, marked "Chief Engineer." [5429

ARMSTRONG SIDDELEY MOTORS urgently require experienced checkers and weight estimators in their aero engine drawing office. Good salaries commensurate with age and experience, also superannuation and insurance scheme. Applications giving full details to Reference Check/2, Technical Personnel Manager, Armstrong Siddeley Motors, Coventry. [0461

A SENIOR vacancy exists on the quality side of this organisation for an engineer with a wide field of experience in plastics materials and processes. Applicants should preferably have had some years of experience, quoting Ref. 3, should be sent to: The Personnel Manager (Technical Employment), de Havilland Propellers, Limited, Hatfield, Herts. [5425

EXCELLENT opportunity offered to a mechanical designer with hydraulic experience, minimum qualifications H.N.C. in engineering or equivalent. This is a superannuated post with excellent prospects in a rapidly expanding firm in the Midlands, first-class working conditions. Apply, giving full particulars of experience, age, and salary required to Box No. 2661. [5434

FERRANTI LIMITED, Edinburgh, require an Engineer with Diesel/ petrol/electric and electronic experience to join a team of Field Trials Engineers engaged in the field trials of experimental radar and navigational systems. The work involved is mainly connected with the running and maintenance of Diesel generating plant and petrol-driven cooling plant but assistance in maintaining the mechanical and electrical aspects of the radar equipment will be expected. Qualifications up to H.N.C. standard preferable but not essential, with at least three years' experience in dealing with such plant. Although primarily based at Edinburgh, much of the work necessitates travel within the U.K. Salary according to age, qualifications and experience. Please apply to the Personnel Officer, Ferranti Limited, Ferry Road, Edinburgh, 5, quoting Ref. E/TID/29. [5380

BRITISH WEST INDIAN AIRWAYS, Trinidad, urgently require shift engineers and inspectors. Applicants should possess A.M.E. Licence in Categories A and C with two endorsements in each category covering airframe and engines of Dakota, Viking or Viscount aircraft. Applications would be considered from holders of A and C licences with at least two endorsements applicable to the above aircraft and engines provided the other two endorsements are for aircraft or engine types similar to, or larger than, those mentioned above. Commencing salary BWI $425 per month, rising to BWI $450 per month plus cost of living allowance of BWI $47.28 p.m. (equal to £1,180-£1,243 p.a.) plus an expatriation allowance of BWI $80 per month. Accommodation available at cost of BWI $90 p.m. Leave, two weeks per annum locally and three months in U.K. at end of each period of three years. Immediate applications to Personnel Officer (Associated Companies), B.O.A.C. Headquarters, P.406, London Airport, Feltham, Middlesex. [5415

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AIRPORT WORKS CAMBRIDGE
FIRST CLASS
Aircraft Inspectors
required
Airframe and Electrical

Applications for these vacancies can only be considered from those with recent experience on Multi-Jet and Turbo-Prop Aircraft.

(Repair, Trial Installation and Conversion)

Suitably qualified applicants will be offered

Staff Rates and Conditions
Including Contributory
Superannuation
Plus Housing Assistance if Required

Comfortable Hostel accommodation available for initial probationary period, or if preferred private lodgings near works can be arranged.

Written applications giving full particulars of experience, etc., should be addressed to
EMPLOYMENT OFFICER

MARSHALL
AIRPORT WORKS CAMBRIDGE
Skilled men required at Cambridge Airport
AIRFRAME FITTERS
AERO ELECTRICIANS
SHEET METAL WORKERS

Programme includes Development Work, Trial Installation and Modification on

MULTI-JET AND TURBO-PROP AIRCRAFT

Good rates of pay, overtime and bonus. Single lodgings available on Housing Estates near Works.

Write, call or phone
Cambridge 56291 Ext. 36.
Employment Officer.

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Required for
'ON SITE' WORK
AIRCRAFT INSPECTORS
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Modification and Repair
Modern Jet Aircraft

Comfortable hostel accommodation (single or double cubicle) with good food whilst on familiarization at Cambridge.

Generous subsistence and other allowances 'on site.'

Send full particulars, experience, etc., and when available, to
EMPLOYMENT OFFICER

GLOSTER AIRCRAFT CO. LTD.

GLOUCESTER

(Member of the Hawker Siddeley Group)

OFFERS YOU AN OPPORTUNITY TO BUILD A REWARDING AND SUCCESSFUL CAREER WITH BRITAIN'S MOST PROGRESSIVE AIRCRAFT COMPANY

Vacancies exist on super-priority work for

DRAUGHTSMEN

on

PROJECT DEVELOPMENT

and

AIRCRAFT DESIGN

(Experienced Structural, Electrical and Mechanical Draughtsmen also required. Aircraft experience not essential)

AERODYNAMICISTS

(Of some years' experience. Fluent mathematical ability essential)

STRESSMEN

(For both strength and flutter calculations)

WEIGHT ENGINEERS

(Senior and Junior. To assist in the control of weights during design and development. Previous experience essential)

These appointments are of a progressive and permanent nature, with commencing salaries based on qualifications and experience

Our large modern factory is situated in the Cotswold Hills, with excellent canteen, sports and welfare facilities, hostel accommodation available and assistance given with housing and with removal expenses

Applications stating age, previous employers and experience, etc., should be addressed to the **CHIEF DESIGNER**

BRITISH OXYGEN ENGINEERING LIMITED

Aircraft Equipment Group

MECHANICAL ENGINEER

with experience on vibration and environmental testing of aircraft equipment and instruments.

The post will entail responsibility for design of test equipment and the supervision of test programmes. Applicants should be familiar with electronic test apparatus and associated instrumentation. Degree or equivalent qualification essential.

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FOR further particulars and application forms write (preferably by postcard) to Secretary, Civil Service Commission, Burlington Gardens, London, W.1, quoting No. 1003/56/84. Completed application forms should be returned by August 23, 1956. [5433

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OIL Company require for their Persian Gulf area an assistant to the aviation superintendent who would be responsible for air traffic control over a large area. Preference will be given to those with pilot's licences with recent all round air traffic control experience. The post is pensionable with home leave every 2 years. Preference would be given to bachelor aged under 36, salary according to qualifications, but total emoluments not less than £1,750 p.a. Write quoting No. 573 to Box No. 115, c/o Charles Barker and Sons, Ltd., 31, Gateway House, London, E.C.4. [5413

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FERRANTI LIMITED, Edinburgh, invite applications for staff appointments as Field Trials Engineers to join teams engaged in the field trials of experimental radar and navigational systems. Although primarily based at Edinburgh, much of the work necessitates travel within the U.K. while one or two of the posts will require overseas travel. Applicants should possess a Degree, H.N.C. or equivalent in electronics or electrical engineering and have had at least three years' experience in centimetric radar techniques. Salary according to age, qualifications and experience. Please apply to the Personnel Officer, Ferranti Limited, Ferry Road, Edinburgh, 5, quoting Ref. FTE/TID/39. [5379

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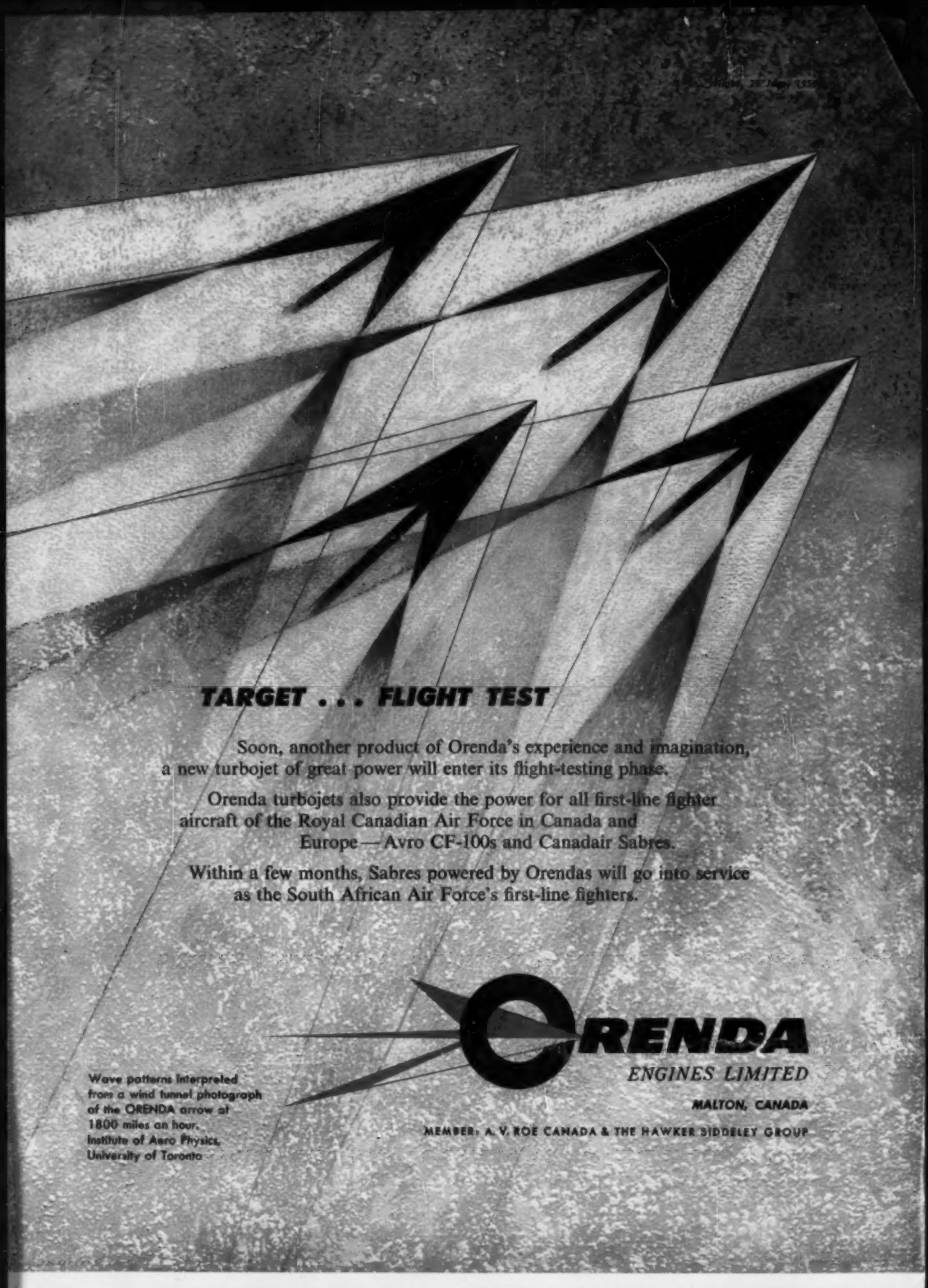

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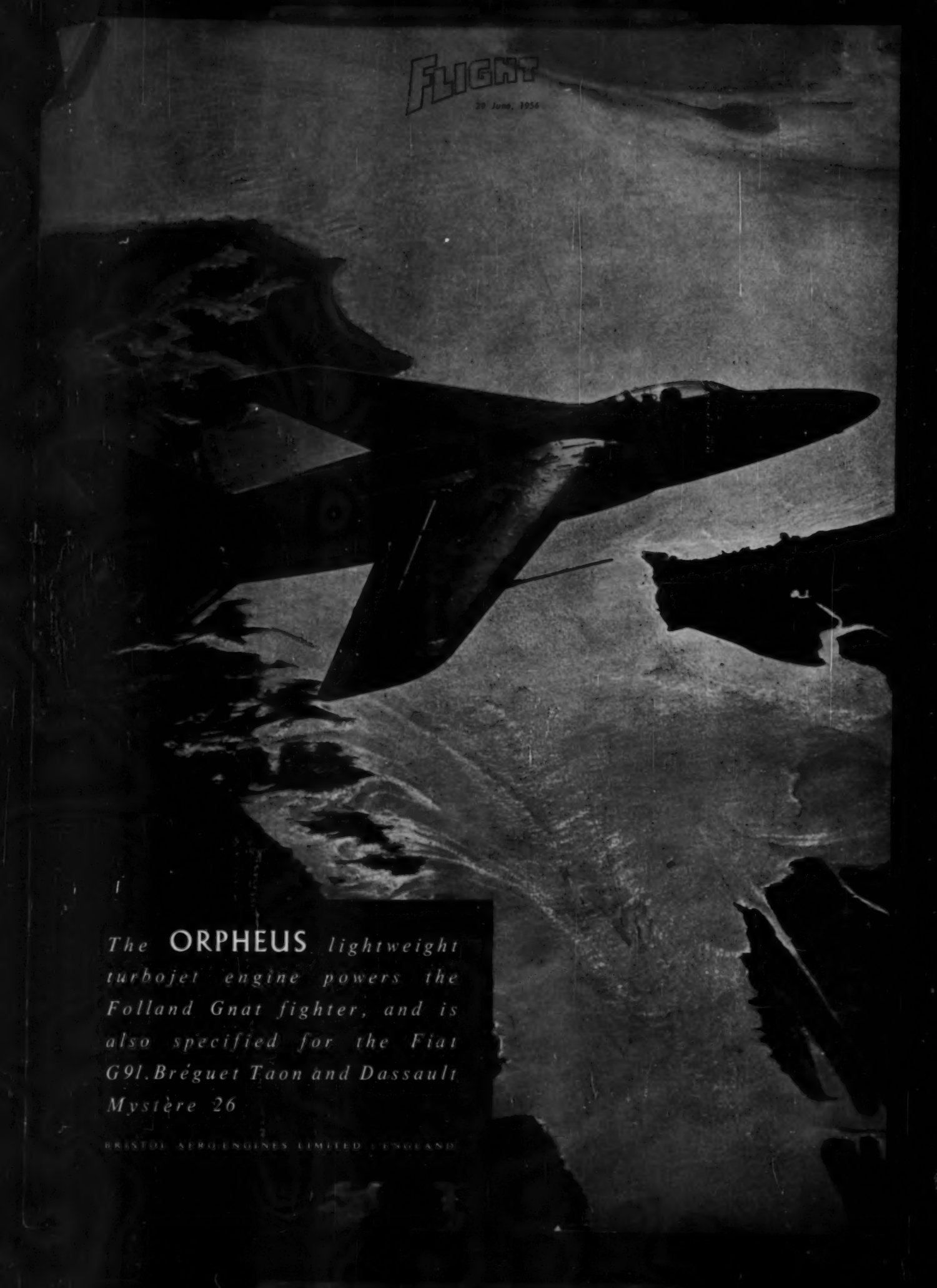

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